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Consolidation of Street Railway Journ al and Electric Railway Review
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Government Ownership in France Assailed in Chamber of Deputies

THOSE who profess to believe that government ownership and operation of public utilities provides the best public service will find scant comfort in the report of a special committee of the French Chamber of Deputies announced this week in Paris. Immediate sale of the French government telephone system to some private organization is recommended so that the people may have the benefit of the development which comes from private initiative.

France has frequently been referred to as a shining example of government ownership of utilities. But now, coming on top of the well-known move to replace the government-operated railroads in private hands, the recommendation to do likewise with her telephones is somewhat of a shock to public ownership advocates. Particularly must this be true when it is read that the telephone system is admittedly the worst in the world; that it is in the grip of a political organization with numbers of useless politically appointed employees; that its operation is such as to discourage additional patronage and that if France wants real telephone service it must turn to private initiative, which alone has shown itself capable of developing utility service to the best interest of the customer.

The report is made not from theory but after extensive investigation of telephone service in the United States, Sweden and Norway. It is thus not only a tribute to the utility service of the United States but also a studied conclusion based on fact. It recommends a privately owned and operated system subject to government regulation like the scheme followed in the United States.

Experience Has Shown State Ownership of Utilities Is Undesirable

CONTRIBUTING materially to knowledge on the advisability of state ownership of water powers, which is now being advocated in several states, is a recent address by P. S. Arkwright, president of the Georgia Railway & Power Company, Atlanta, Ga. The occasion was the meeting of the Association of Edison Illuminating Companies at White Sulphur Springs a couple of weeks ago. An abstract of the address appeared in the Oct. 21 issue of *Electrical World*. It is of interest to electric railway men because of the fundamental principles involved.

Stated briefly Mr. Arkwright pointed out these facts: In the middle of the last century various states, in their endeavor and anxiety to develop railroad communication within their borders, built railroads by the use of state funds and state credit. Practical experience with public operation, with the attendant political patronage, proved conclusively to all of these states the inefficiency, the impracticability of successful government operation. In other words, it failed and the roads were sold or leased. Eleven of the states repudiated their debts. Finally every state in the Union, except Connecticut, Massachusetts, New Hampshire and Vermont, provided, either by constitutional clause or amendment, a definite prohibition against any similar future use of state funds and credit, setting forth the principle of the use of public funds for necessary governmental functions. Consequently, all attempts to authorize state ownership of water powers or other commercial enterprises today will require in most states a constitutional amendment to open gates which were once judiciously closed.

There Can Be Standardization Without Stifling Initiative

IN THE FIELD of electric railway engineering, committees and individuals are striving to bring better order out of what was once chaos in the design of rails, special trackwork, track details, car parts, car bodies, overhead construction and details, etc. In spite of this, designs in some parts of the field are being modified more actively at present than ever before; in other words, what the mathematician would call the "rate of change" in design has a high present value. Does this mean that the efforts of the standardizers are in vain? Have they been wasting their time these many years? The answer is, emphatically, No! They should be encouraged in every way to keep up the good work, for they are exerting a restraining influence upon unnecessary invention—or useless differentiation—and will gradually evolve a body of standards that almost everybody will accept.

Superficially, there seems to be a conflict between standardization and invention. One tends to stabilize things, the other to change them. One seems to discourage ingenuity and originality, the other to stimulate them. An association after years of study no sooner selects, say, some rail sections which seem adapted to track requirements, when along come a number of new designs. An attempt is made to select certain uniform features in car design, while new designs are popping up over night. What does all this mean? It means, on the one hand, that the work of standardization is not stifling originality. It means, on the other, that much deference is still paid to time-honored "local conditions." It does not mean, however, that the standards are not exerting a powerful influence. There is no means of knowing what "local conditions" would have done with designs without this wholesome restraint. And the effects of "local conditions" are not all bad, because they have often furnished the stimulus needed to cure some widespread ailment and produced something worth standardizing later.

It would be unfortunate if the more progressive engineers in the electric railway industry were divided into two extreme groups respectively of standardizers and inventors, with a neutral group of followers in be-

tween. It would be far better for all to be striving for that state of mind which welcomes progress in both directions. That is, the ideal engineer is one who will strive to assist in the standardizing of all that is inherently standardizable, while still being alert to improve the standards through use and to fill in the gaps by the aid of invention. Like legislators and lawyers, some engineers lean toward codification; others, like social reformers, are interested most in reformation. Both types are useful, to themselves, to each other and to the neutrals. The standardizer should, however, expend his effort principally on widely used products of simple character; while the inventor should make the widest possible use of all available standards. As far as possible each should absorb the spirit of the other.

New Methods in the Selection of Employees

SO MUCH depends, both in safety of operation and financial results of an electric railway, on the proper selection of employees that it seems strange so little attention has been given to the subject from a scientific point until recently. For many years the matter was left on small systems to the superintendent of transportation and on large systems to an employment agent, who, except for an examination for physical requirements and references as to character, depended largely upon his judgment as to the men to be engaged for the positions of motormen and conductors. Those who were most successful in choosing among the applicants for jobs were considered "good judges of character," but they had few methods which they could explain to others as to the way in which they exercised their judgment, except to say that their decision was based largely upon the appearance of the applicant, his method of replying to simple questions, and possibly a few mental rules which each person charged with this work had drafted for his own guidance.

Probably the first serious efforts in this country to lay down more definite methods to guide in the selection of employees were made by Martin J. Insull, when general manager of the Louisville & Northern Railway & Lighting Company, some ten years ago. Mr. Insull became impressed with the occurrence at times of what he called "man failure" among electric railway operatives, and in a letter to this paper published Feb. 17, 1912, urged that a fund be raised large enough so that the problem could be studied from a scientific point of view at some of the well-known universities which have given special attention to psychological investigations. Shortly thereafter he got in touch with Professor Münsterberg, then professor of psychology at Harvard University, who had been giving considerable attention to psychological research as applied to the selection of employees, and some work was done along the lines of the scientific selection of platform men on the Boston Elevated Railway system, but Professor Münsterberg's death put an end to these experiments.

The need for quickly and systematically determining the most eligible candidates for promotion in the army at the time of the war greatly stimulated the study of this question and, as most people know, various tests were prepared and applied under the direction of the division of psychology of the Medical Department, United States Army. They proved so successful that they or modifications of them have gradually become introduced in industry, and the reports last year and this year of the committee on personnel and training of transportation employees of the Transportation & Traffic Association have greatly stimulated interest in the subject in the electric railway industry.

The most extended investigations into the subject, with the possible exception of those of Professor Münsterberg in 1912, are those recently conducted by the Market Street Railway of San Francisco, referred to briefly in the paper by Mr. McCants in the last issue of this paper and given more detail in this issue, where tests were made of a number of men on the system. The results thus obtained were supplemented by personal information furnished by the division superintendents. The industry is to be congratulated on the production of these records, for they afford a practical demonstration of how to go about the application of more scientific methods in hiring trainmen.

Broadly speaking, they are more instructive from what they disprove than from what they prove. "Good motormen," to quote the report, "are not born, but are made of good substantial human material." So far as this survey goes, the best qualifications for a good motorman are intelligence, health and contentment, the last including absence of domestic and financial worry—homely virtues these, but the foundation of good citizenship.

The investigations at San Francisco have been largely along the lines of oral and written tests, and in this respect they differ from some of those used abroad and the apparatus of Professor Münsterberg, which provide for measuring the physical reaction to events similar to those which would be experienced on a car. The difference is interesting and the trials at San Francisco should be only the beginning of the study of this topic. Further information is greatly needed.

Large System vs. Individual Operators in City Transportation

THE hearings now being conducted by the New York Transit Commission on bus operation have brought out a number of interesting facts and several charges of graft. Whether or not these are correct, one point at least has been clearly shown. That is the great superiority of regular and regulated transportation service over that conducted by individuals under little or no regulation and with uncertain financial responsibility. According to the testimony, there has been greater crowding on the buses than ever there was on the subway, and lines have been leased to operators who had little capital so that there is now a total of more than a million dollars in potential damage claims against the city. Probably one of the reasons that there has been intolerable crowding of buses in the rush hours is that an adequate number of buses to handle the peak load would increase the difficulty for the individual owners to make profits on account of the resulting surplus of buses in non-rush hours.

Some of these troubles come about, probably, because it is more difficult to control a large number of independent operators than one large company, and it is obvious that the latter can introduce more scientific and reliable operation and better discipline than is usually practicable for a large number of individual operators. Incidentally, this constitutes one advantage on the side of the city for electric railway operation. Electric cars have to be part of a co-ordinated system, which is not necessary with buses.

Dayton Operates Large Light-Weight One-Man Cars

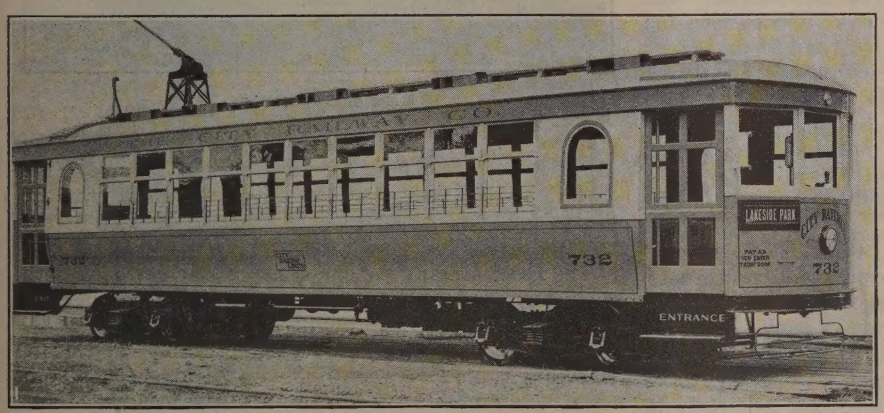
New Cars, 42 Ft. Over All, with a Seating Capacity of Fifty-one and with a Weight of Less than 500 Lb. per Passenger Seat, Are Operated Satisfactorily by One Man

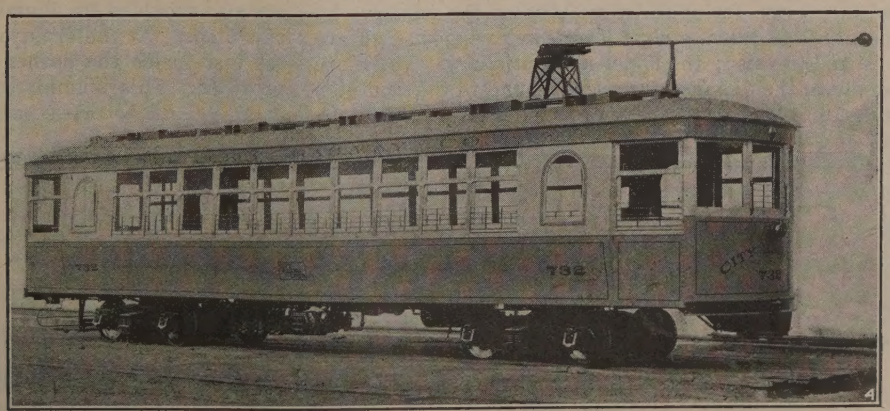
THE City Railway Company of Dayton, Ohio, has recently placed in service fifteen new one-man cars, which provide large seating capacity with exceptionally light-weight construction. Advantage has been taken of the experience gained by other companies operating one-man cars to incorporate in this new rolling stock all of the advantages and at the same time eliminate some of the points which have appeared somewhat questionable. Painted in colors of dark and light yellow, these cars present a very attractive appearance, and due to the oval top windows at each end present somewhat the appearance of an interurban car. When compared with other cars operated by the City Railway Line, they appear somewhat lower due to their having 26-in. diameter wheels and an arch roof, which also lends to the low appearance.

The extreme width of these cars is 8 ft. 4⅜ in., but the sides are curved inward below the rail belt to a narrower width, which is of advantage, particularly in Dayton at points where parking of automobiles limits the clearances for cars to a very low amount. Another noticeable feature of the exterior of these cars is the stationary steps. The management of the railway feels that this type of step causes fewer boarding and alighting accidents. Certainly they are less expensive to maintain than a folding step. The step construction is such that the outside edge of the step is in line with the upper side of the car body, so that no additional clearance is necessary. As all the lines in Dayton are arranged for loop operation, these cars are single end, which also has simplified the construction to a marked degree, and one side of the car is entirely without doors or steps. The low car made it necessary to elevate the trolley stand, and in mounting this the construction which has become quite familiar on Birney cars is used.

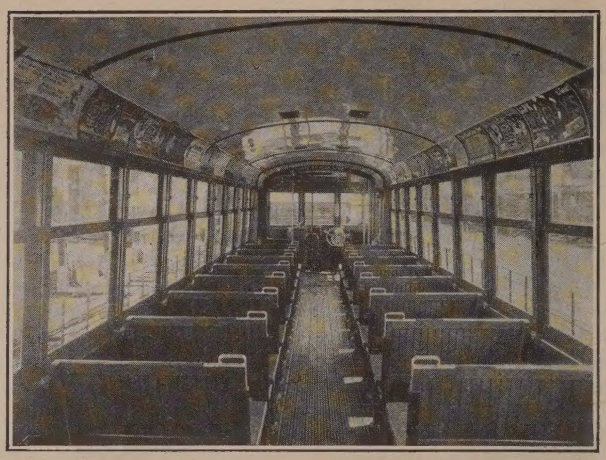
GENERAL DIMENSIONS AND DETAILS OF DAYTON CAR CONSTRUCTION

Length over dashers	41 ft. 11 in.
Length over body	33 ft. 3 in.
Length of platform	4 ft. 4 in.
Rail to top of trolley board	10 ft. 5 11/16 in.
Rail to bottom of side sill	28 11/16 in.
Rail to step	16 in.
Step to platform	14 in.
Ramp in car floor	2⅛ in.
Post centers	30 in.
Clear height inside	7 ft. 3 in.
Extreme width	8 ft. 4⅜ in.
Bumper extension	2 in.
Width of seats	36 in.
Width of aisle	25 in.
Door opening	36 in.
Truck centers	23 ft. 9 in.
Wheelbase	5 ft. 0 in.
Diameter of wheels	26 in.
Seating capacity	51
Weight, completely equipped	25,300 lb.





No. 1—Side of Car with Entrance and Exit Doors. No. 2—Operating End of Car. No. 3—Turnstile Installation at Exit Door. No. 4—Side of Car Without Doors



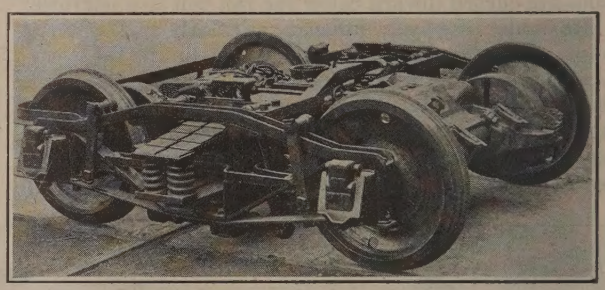
INTERIOR AND SEATING ARRANGEMENT, LOOKING TOWARD OPERATING END

These cars are operated as pay-as-you-enter, with the rear door used as an exit. As a barrier to prevent entrance at the rear door, each car has a Syracuse car turnstile, furnished by the Turnstile Car Corporation, Syracuse, N. Y. However, since the introduction of this type of car in Dayton, the traveling public has become so familiar with the method of entrance and exit that observation shows practically no attempt being made to enter the rear door. The various painted signs have also proved of advantage in directing passengers. On the front end at the right-hand side is a sign reading "Pay as You Enter Front Door." Above the front step is the word "Entrance," and above the step of the rear door is the word "Exit." The lettering of the cars has been kept as simple as possible. Above the windows on the side is "The City Railway Company," and in the center below the windows is a square which incloses the words "City Railway Lines." The words "City Railway" also appear in a semi-circle over the headlight and underneath the trolley catcher at the front and rear ends of the car. Other than this the numbers are the only additional lettering which appear at each end and also on the sides at both ends.

A feature of the construction which is of extreme interest to those maintaining car equipment is that used for the windows. A metal strip runs down between the windows of each pair. This can be readily removed and thus the windows can be lifted out. The window guards which extend up to a height of about half the lower window are also held in place by this construction, and they come out at the same time as the windows by loosening the metal strip. The lower window sash are arranged to raise; the upper are stationary. There are two steps, the distance from the ground to the first step being 16 in. and from this step to the platform 14 in. A ramp in the car vestibule of 2¼ in. is also used. A liberal door opening of 36 in. is provided. Sliding doors operated by pneumatic door engines are used.

A vertical white metal pipe stanchion is provided just inside the door opening which is of convenience to passengers boarding and alighting. On the entrance end just to the right of the operator is a short pipe stanchion on which is mounted a fare box. This is used only as a fare box support and does not extend to the roof. Another pipe stanchion a little farther toward the car body serves as a support for the motorman's seat and is provided with a back. This stanchion extends to the roof and the upper part is fitted with a support for a curtain, which is arranged to pull down back of the operator, so as to shield the windows from the glare of light inside the car body. Another pipe stanchion is provided at the front end just at the end of the left-hand longitudinal seat. The car trimmings are of aluminum and white metal stanchions are used throughout.

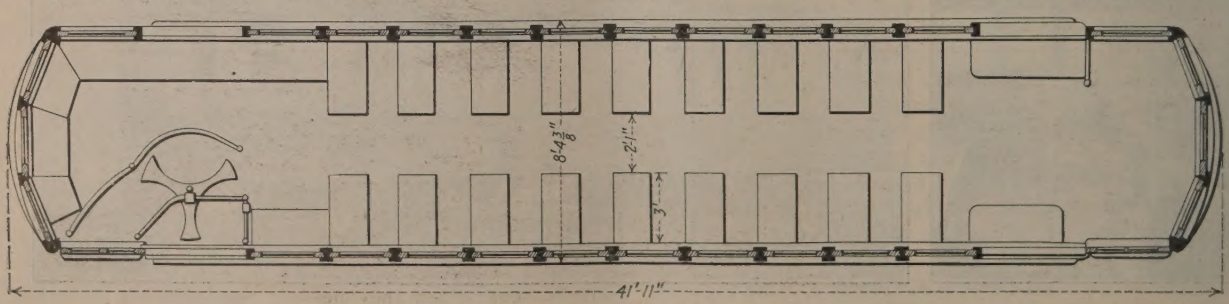
At the rear of the car stationary seats are provided along the left-hand side and extending around the end, the space at the other side being occupied by the turnstile and a pipe railing for directing the flow of passengers as they leave the car. The seats are a cherry



TYPE OF TRUCK USED

stained, flat type, the aisle corners of the back being provided with grab handles. A particular feature of the seats is their width of 36 in. The aisle width is 25 in. Straps for standing passengers are used in front of the longitudinal seats at both the front and rear of the car.

The headlining of the car is of agasote fastened with cherry molding, and the illumination of the car body is furnished by ten lamps of the 50-watt mill-type series, burning 120-volt. This type of lamp is short and has a frosted bottom, and when lighted gives uniform illumination and presents a very attractive appearance. Lights are also provided for illuminating both the entrance and exit steps. At the front a single lamp with a shade is set just inside the dasher at the floor level in a space provided. This illuminates the step in a very effective manner. At the rear a bank of five lamps is located over



FLOOR PLAN OF DAYTON ONE-MAN CAR

the doorway. With lights in this position, the step is not only illuminated but also the street surface at the car door.

The City Railway of Dayton is changing a number of its cars from hot air to the electric system of heating. The heater equipment consists of thirteen cross-seat and three panel heaters. Type 405-EB Gold Car Heating & Lighting Company's heaters are used. These heaters have interchangeable elements, supports and coils. They are of a two-coil type, both coils being alike. An additional vestibule heater located just to the left of the operator is also used. This is a Gold Type 144-E 600-volt, 1,200-watt heater. Gold Car Heating & Lighting Company's thermostatic control is also used for the heaters and the coils are arranged in two circuits. The control provides for all heaters being cut in and out at the same time, and should the thermostatic control become inoperative, heat is shut off from the car, so that notice of the trouble will be given immediately in order that it can be repaired.

The safety devices are the same as have been used by the Eastern Massachusetts Street Railway for a considerable time. An emergency cord which runs through the car is provided, and pulling this cord trips the circuit breaker, operates the emergency valve so as to apply the air brakes and balances the air pressure in the door engines so that the doors can be opened by hand if desired.

The trucks are the Cincinnati Car Company's arch-bar combination elliptic and coil spring type. Each truck is equipped with two GE-264 motors, which makes four motors per car. K 35-HH control is used. The air brakes are Westinghouse and a DH-16 compressor is used. The trucks are also provided with Gould slack adjusters.

Other features of the equipment include a Cleveland fare box, Hunter destination signs, Gebhart safety door signal equipment, Consolidated Car Heating Company's buzzers, H. B. life guards and O. B. type trolley catchers. The cars were built by the Cincinnati Car Company and are of all-steel construction. An accompanying table gives some of the principal dimensions.

Car Cleaning on the Illinois Traction System

The Car Cleaning Is Carried Out on a Regular Program Whose Details Are Given—The Work Is Done by the Transportation Department

By J. B. Hughey
Superintendent Sleeping and Parlor Cars, Illinois Traction System

WE OF the Illinois Traction System think that one of the very important features of passenger service on electric railways is clean, comfortable cars. For this reason early in 1914 a car cleaning department was established to take over the cleaning of cars formerly done by the operating department. The primary business of the car cleaning department is to keep all cars, stations, etc., clean. At the more important terminals both day and night shifts are kept, each shift working under a foreman who gets his instructions from the head of the department.

Each foreman is permitted to select his own men and is held responsible for the condition of the cars departing on his shift. The department is supervised by the writer, in addition to his other duties. The work of the car cleaning department described below is that followed on all passenger cars, not simply on the sleeping and parlor cars.

Each car cleaning foreman is supplied with a blank form as follows:

"..... Terminal
Date.....
Report of work done on car No.....which was a layover at this station from.....M. to.....M.

1. Were the spittoons removed and cleaned?..... How many on car?.....
2. Floor of car well swept?..... (A2) Then mopped?.....
3. Windows cleaned inside and outside?.....
4. Interior woodwork and lamp globes wiped and dusted?.....
5. Were parcel racks cleared of papers, etc., and dusted?.....
6. Was water cooler emptied, cleaned, refilled and replaced?.....
7. All inside partition glass cleaned?..... (A7) Hopper washed?.....
8. Floor of toilet room swept and scrubbed.....
9. Motorman's cab cleaned and supplied with clean spittoon?.....
10. Was the stove room thoroughly cleaned?.....
11. Were seat pedestals wiped off with oiled waste?.....
12. Were seat covers turned, changed or adjusted? State which.....
13. Were the platforms and trap doors swept and scrubbed?.....
14. Was the car wiped or washed down on the outside? State which.....
15. Were the steps cleaned?..... (A15) Glass in folding door cleaned?.....
16. Did you make a personal inspection of this car to see that it was clean and in proper shape for service?.....
17. What time was the inspection made?.....

Remarks.....
.....
.....

Each foreman is required to fill out one of these forms for each car that is a layover for more than three hours in his terminal, and if all items above mentioned are not done, the reason must be given on a separate paper which is to be attached to the report of the car in question. All reports, together with time slips for each employee, are sent to the office of the superintendent. The work in detail is as follows:

The Work in Detail

1. The spittoons are removed and washed in a strong solution of Creo-Sul disinfectant by means of a bucket and short handle brush. A small portion of disinfectant is left in each spittoon.

2. The floors of the cars are swept dry, except in cases where they are to go out right away. Then the sweeping compound is sprinkled on the floor. In all cases a few windows are raised on each side so as to let the air in and dust out. All hair No. 16 or No. 14 push brushes are used.

3. The windows are cleaned with Bon-Ami, applied with sponge, when they need it, but are always wiped off with clean dry waste when the cars are cleaned.

4. The interior woodwork and lamp globes are wiped and dusted on all of the cars which are all-night or all-day layovers. If the cars seem particularly to need it, this cleaning is done regardless of the length of the layover time.

5. The parcel racks are given attention on every car cleaned.

6. The water cooler of every layover car is emptied and washed out. It is steamed at regular intervals and is filled with fresh water and clean ice a short time before it is set for the reception of passengers.

7. The partition glass is cleaned when this work is needed.

7A. The hopper bowls are washed out on all layover cars. A strong solution of Creo-Sul and a special hopper cleaning brush are used.

8. The floors of the toilet rooms are of course swept when the other parts of the cars are swept, and when a scrubbing is needed, it is given with a broom and plenty of strong disinfected water. We give this work a number on the blank so that the foreman in his general inspection will have to look at it to answer the question truthfully.

9. The motorman's cab is cleaned and always supplied with a clean spittoon.

10. The stove rooms have to have special attention to keep papers, fuel, etc., that are thrown behind them on the road cleaned out.

11. The seat pedestals are wiped off with lightly oiled waste when they look dull. It brightens them up and they look much better.

12. By seat covers, we mean what are sometimes called "tidies." They are 27 in. wide and are tied over the seat backs so as to keep the dirt from the heads of passengers off of the plush and also, and this is the main reason for having them, to furnish an unquestionably clean place for the tired passenger to lean his weary head.

13. The platforms are always of course swept, but they are scrubbed only when they need it.

14. When a car is on a layover long enough, it is wiped down on the outside with clean dry waste, or if the weather is bad and the car is in no condition to wipe, it is washed with water, brushes with handles 10 ft. long being used.

15. This work is the same as described under 13.

15A. This work is like that under 7.

16. We consider this one of the most important of the list. Every foreman has positive orders to make a personal inspection of every car that is to go out on his shift to see that it is in proper shape for service or, if not, to have it put in shape.

17. So that we shall know what time the foreman was on the car, etc.

The time required for one man on this work is about as follows:

No. 1	5 to 8 minutes	No. 9	10 minutes
No. 2	25 minutes	No. 10	10 minutes
No. 3	45 minutes	No. 11	10 minutes
No. 4	15 minutes	No. 12	10 minutes
No. 5	5 minutes	No. 13	10 minutes
No. 6	5 to 20 minutes	No. 14	.....
No. 7	Included in 3	No. 15	20 minutes
No. 7A	5 to 10 minutes	No. 15A	
No. 8	10 minutes	No. 16	5 minutes

Thus it will be seen that it requires about three hours time for one man to do the work on one car for what we term a quick terminal clean. This work is done both by day and night wherever the cars are layovers and we keep a force.

The general cleaning is always done during the day and requires ten hours for each of five men. Quite a bit of additional work also is done. The program in general cleaning is about as follows:

The cars are placed on a rip track and compressed air, furnished at most points from a neighboring power house, is used in blowing out the plush upholstery. The compressed air is also used to blow out the accumulation of dirt from under the heater pipes and other places that cannot be cleaned by sweeping.

The woodwork is washed with a good neutral soap and rinsed with clear water, and when it is dry an application of a harmless renovator is used. The floor is then scrubbed, windows shifted and the glass cleaned on both sides of both sash. A final touch up with a clean cloth is made so as to get off any of the renovator that may have been left. The lamp globes are removed and washed if need be and clean seat covers are placed in the car. Then the outside of the car is gone over with some effective cleaner which is washed off with clear water by the use of a hose and car washer brushes. When dry a renovator is applied to the paint on the outside of the car and then is wiped off with dry clean waste.

The Woodwork Is Washed Once Every Six Months

Compressed air is used on the cars as often as needed, but the woodwork is washed but twice each twelve months, except in cases where cars have been occupied by persons with contagious disease. In that case the woodwork is thoroughly washed and the car is fumigated with formaldehyde and permanganate of potash mixed together, which makes a very strong and effective fume. This work is done also regularly in March or April and again in October.

To comply with the federal laws regarding the cleaning of water containers, coolers, filling cans, etc., the company has a steam line into the car yards or carhouses at most important terminals. Steam is furnished from the neighboring power house and a record is kept of the date when the coolers are steamed.

In connection with the car cleaning department the company also operates a small laundry. While this is maintained chiefly for the purpose of taking care of the linen used on the sleeping and parlor cars operated by the company, the seat covers used on the coach seats as well as the cleaning rags are washed there at a very reasonable cost.

The renovators which we use are special No. 10, made by the Cymol Chemical Company, and the Brooks renovator.

We have found it best to have the car cleaning department a part of the transportation department of the company rather than a part of the mechanical department of the company. One reason is that coach cleaners can usually be employed for less than one has to pay a mechanic. While we work in perfect harmony with the mechanical department, each has its own foreman with duties which do not in any way conflict with those of the other.

The repair shops of the company are at Decatur and whenever a car is taken there for either light or heavy repairs it is in charge of the mechanical department. The nature of the repairs may result in an accumulation of some dirt so the cars are always swept and otherwise cleaned ready for operation before they are returned to service.

Welding Practice of the Pacific Electric

The Extent of the System and the Large Amount of Special Trackwork Used Give Welding Operations Particular Importance—A Large Amount of Welding Is Done on Both Open and Paved Tracks

BY CLIFFORD A. ELLIOTT
Cost Engineer Pacific Electric Railway, Los Angeles, Cal.

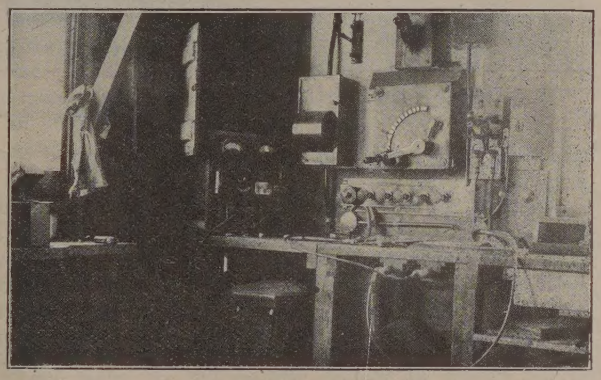
AN IDEA of the extent that welding operations are of value to the Pacific Electric Railway can be gained from a brief summary of the extent of the system and the large amount of special work employed. The system comprises a total of 1,105 miles of track, of which approximately 250 miles is located in paved streets. There are more than 118 railroad crossings alone with steam lines and more than fifty-five complicated special work layouts in the streets of Los Angeles. A portion of the company's tracks are of combination gage construction for joint operation with the Los Angeles Railway, which is a narrow gage line, and this complicates the construction of the special trackwork.

The company has made use of welding in connection with track repairs for the past ten years and has organized special welding gangs for carrying out all important work of this nature. The first welding machines employed were of a grid resistance type quite similar to the machines now being marketed by the Indianapolis Switch & Frog Company. These machines were built in the shops of the company at Los Angeles, a royalty being paid the patentees. These early machines were 2 ft. x 4 ft. x 6 ft. in dimensions and mounted on a wheel-base weighing approximately 1,250 lb. Direct current was used at a potential of from 550 to 600 volts. Four of these machines were constructed and are still in use on the system.

Due to an increase in the amount of welding work necessary, additional equipment has been placed in service as follows:

Five Indianapolis Switch & Frog Company's 600-volt resistance type portable welding machines. Four of these are used in city work and one in open trackwork.

One No. 3 welding torch.

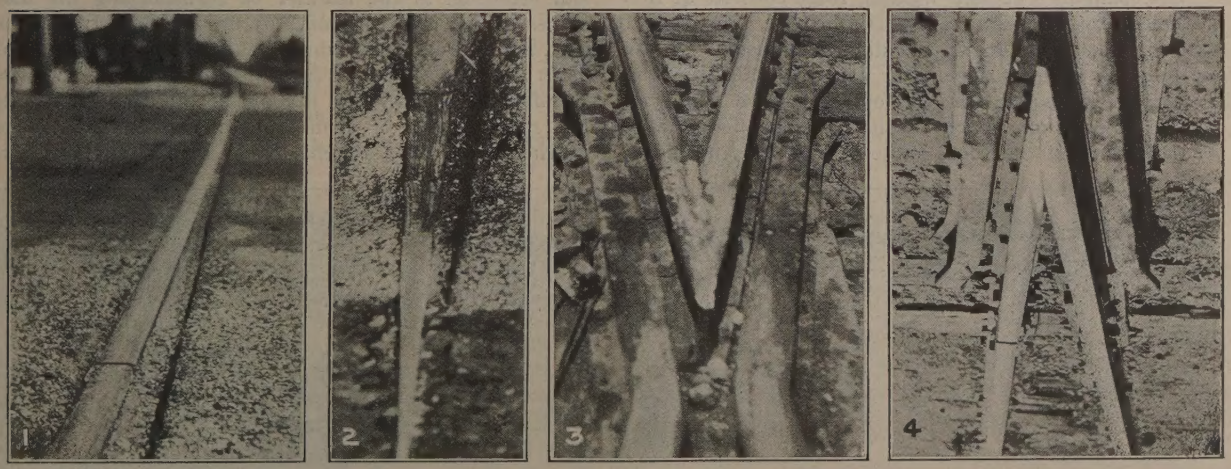


WELDING EQUIPMENT IN BONDING SHOP. D.C. OUTFIT AT THE RIGHT WITH A.C. OUTFIT AT THE LEFT

Two acetylene cutting torches for various work.

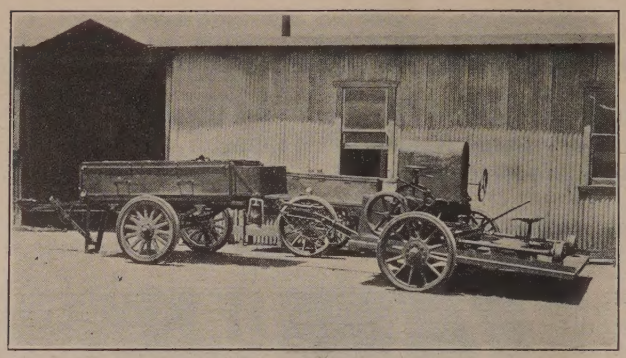
One 500-volt portable resistance welder of the Electric Railway Improvement Company's make. This machine is used for welding work in city streets during the daytime where immediate emergency repairs are required which cannot wait for night forces.

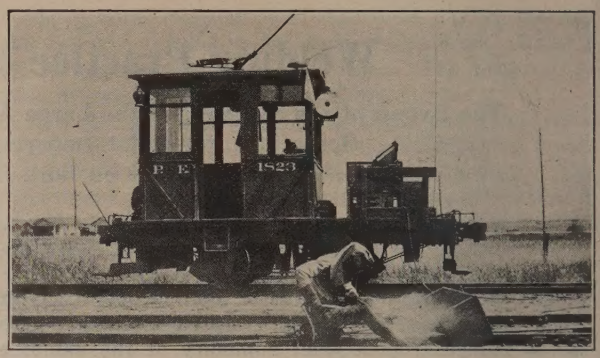
Welding is now found of advantage for a large variety of repairs. In the reconstruction of tracks in paved streets, bolts and nuts are now welded on special work and at rail joints. Nut-locks are omitted as the depositing of metal on the end of the bolt just outside the nuts prevents them from coming loose. Under normal conditions one welding foreman and one helper can weld 1,522 bolts in eight hours. In this work 1 lb. of welding steel is needed for twenty-four bolts welded, the size of the bolts being 1 in. x 4½ in. This particular job was in a paved street where automobile traffic was light and where the average interval between cars was fifteen



RAIL JOINTS AND FROGS AND AFTER REPAIRING

No. 1. Worn rail joint at oil-macadam paved road crossing.
No. 2. Same joint after being built up, ready for grinding.
No. 3. Open track frog point turnout with worn point.
No. 4. The same frog point after repairs are completed.





AT LEFT, RAIL GRINDER COUPLED TO WELDING MACHINE FOR HAULING TO JOB. AT RIGHT, WELDING A WORN FROG POINT BY USE OF EQUIPMENT MOUNTED ON SPECIAL LINE CAR

minutes. This method of welding bolts has proved very satisfactory.

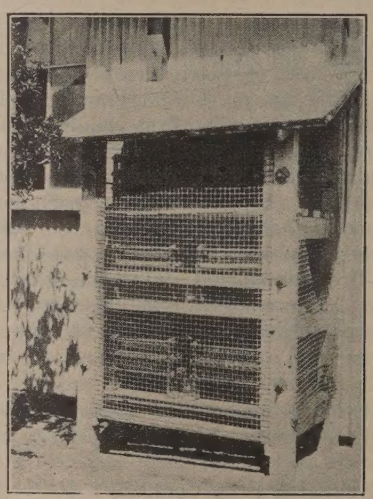
Another use for welding which has cut costs considerably is in the building up of rails in the field to form a compromise joint at railroad crossings where both a heavy girder rail and a light section low T-rail are used. The life of special trackwork has been increased considerably through the use of welding equipment in making repairs. Previously repair work prolonged special trackwork life from three months to eighteen months, but the use of welding, together with more efficient methods, now prolongs the life from one to three years.

With open track construction the building up and welding of battered rail ends at joints has proved very satisfactory. The company maintains more than a thousand highway crossings at various points on its lines and these locations are the ones where the large majority of the work is necessary.

Accompanying illustrations show some of the work being done at an oil-macadam paved crossing. After one of the joints was rebolted and the ties renewed and tamped the rail end of the joint still showed a worn surface of $\frac{1}{8}$ in. extending back for a distance of 28 in. In building up this joint the tread side of the rail was completed first, so as not to interfere with the passing of trains. After the welding was completed the joint was ground down with an Atlas rail grinder. Another illustration shows a frog pointed in a turnout in open trackwork which was reclaimed by electric welding.

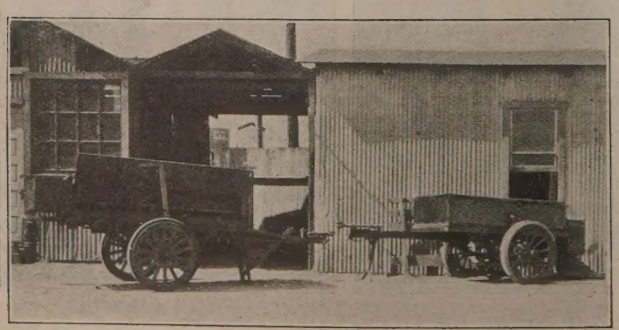
The company's present welding force consists of four foremen, four welders and three helpers, who are all under the supervision of a bonding supervisor. By this system the bonding supervisor can give this work his individual attention for the entire system and give closer supervision, which results in much better work than by having the force subject to the partial supervision of the general track supervisor of each division on which they may be working.

Every effort has been made to give welding work special attention at all times. Welding forces have been impressed with the fact that satisfactory work requires special skill and attention. For making the welds and building up joints the highest grade of welding steel obtainable has been used. Acme special round tool steel $\frac{3}{16}$ in. in diameter, which is a high-grade carbon steel, has been found very satisfactory for reclaiming railroad crossings, frogs, switches, joints, bolts and special work. The Indianapolis Switch & Frog Company's grade B welding tool steel $\frac{1}{4}$ in. in diameter is used for welding all manganese crossings, frogs, switches and special work.



MOUNTING OF GRID RESISTORS OUTSIDE BONDING SHOP

Another point which has been given special study and attention is the manner of transporting the machines to and from the job. At first an auto truck was used for this purpose, which hauled the welding equipment installed on a trail truck. While this method was satisfactory for city use, it could not be used for reaching repair work in open track or where the tracks operated over private right-of-way. To meet these con-



AT LEFT, TWO WELDING MACHINES MOUNTED ON RUBBER-TIRED WHEELS FOR TRANSPORTING ABOUT CITY STREETS. AT RIGHT, WORKING WITH A 500-VOLT PORTABLE RESISTOR WELDER

ditions a special line car is used. This line car was fitted up in the company's shop and the welding equipment is made a permanent part. The current for welding is taken from a tap on the trolley pole through a 250-amp. circuit breaker. This safeguards the equipment in case of short circuit or line interference.

A special cart has been designed for handling the rail grinder. This is constructed as low to the ground as possible in order to make easy the handling of the grinder on and off the cart at the point where the work is done. This cart can also be coupled to the welding machine so the two can be transported to any desired location at the same time.

In addition to the portable welding equipment the railway also has a direct-current grid type outfit and an alternating-current welding set installed in the engineering department's bonding shop. In order to provide for efficient ventilation of the resistors used with the d.c. outfit these are mounted outside the shop building and are screened with a coarse wire screen. An accompanying illustration shows this mounting. Other equipment necessary, such as circuit breakers, switches and connecting cables, is mounted above a work bench inside the building. The a.c. equipment consists of a transformer, switches and other necessary apparatus. When the welding forces are not required on trackwork, there is always plenty for them to do in the bonding shop. The work done consists of reclaiming and welding various bonding tools as well as track, bridge and signal tools. The equipment is also used for repairs to pneumatic tie-tamping and paving-cutting tools, which require frequent attention.

New uses for welding equipment are being found constantly which increase its field of usefulness and the Pacific Electric Railway, like most other railways that have had experience in welding, now considers this as a most essential part of its maintenance equipment.

Continuing Old-Type Motors in Service Is Costly

Modern Motors Require Maintenance Expenditures About One-fourth Those for Obsolete Types, Besides Producing Other Economies in Fewer Pull-Ins Less Weight and Faster Service

BY H. G. MORSE
Railway Engineering Department, General Electric Company, Schenectady, N. Y.

THERE are still in active service in this country some thousands of railway motors from twelve to twenty years old which ought, on the score of reduced maintenance costs alone, to be retired from service and replaced by machines of modern design. If to this be added the greater reliability of the new motor and the consequent fewer failures in service, the reduction in weight and the greater schedule possibilities, it will be found that there are few properties that could not show an interesting return on such an investment.

An average of figures recently compiled shows that the cost of keeping a twenty-year-old motor in service is four to five times that occasioned by a modern type even when the latter is as much as five years old. Before discussing the reason for so great a difference, some actual figures will be illuminating. On a large Eastern property during 1920 on cars in active service the records show that of 3,785 motors of twelve years average age, 25.5 per cent or 1,004 armatures were rewound, while for the same period 609 motors of an average age of five years required 8.7 per cent or fifty-three armatures to be rewound. This, as can be seen, is not a record of brand new motors. As a matter of fact, only about 15 per cent of the second group had been running less than two years, while 40 per cent had been in service for seven years.

On another large Eastern system in 1920, 1,885 motors of obsolete design, used mainly in tripper service and therefore worked less severely than on all-day runs, averaged $7.30 per 1,000 motor-miles for repairs and inspection, whereas 1,412 modern type motors in regular service averaged only $1.19 per 1,000 miles in their fourth year of operation.

On a property in the Southwest 220 old-style motors in 1921 averaged $4.49 per 1,000 motor-miles, and 104 much later design motors averaged $1.42, although in their ninth service year. A large part of the older motors were used only for tripper service, while the later motors were on cars kept on the road to the maximum extent. Another system in the South reports costs on their older motors, of which approximately 1,000 were in operation in 1920, ranging from $2.50 per 1,000 miles for the best to $5.40 for the worst, averaging $3.75. This compares with 50 cents per 1,000 miles on 100 modern motors in service for five years.

Instances like these could be recounted indefinitely, but these are sufficient both in geographical location and quantities of motors involved to prove the case for the new motor. Experience shows that modern motors properly applied should not cost for repairs and inspection more than $1 per 1,000 motor-miles during the first five to seven years, or from $30 to $40 per motor annually to keep them in first-class operating condition. On most motors put in service prior to 1912 operating costs will average $120 to $200 annually on the same mileage basis.

The reason for these big differences is simply the rapid advance that has been made in railway motor design and construction over the past ten years. Better understanding of insulation and ventilation problems and improvements in mechanical design and construction have resulted in a motor of less weight and greater reliability. An examination of repair charges to old-type motors will show that a large percentage of the trouble is due to armature failures with repairs to fields, brush-holders, gears and pinions and to accessory equipment in the order named. The armatures of new motors are better insulated, better ventilated and of better mechanical design so that they are fundamentally improved. Armature and axle bearings are waste packed and oiled, which in itself is a vast improvement over grease lubricated motors.

A large percentage of armature failures is due to armatures getting down on the pole pieces, which is directly traceable to insufficient lubrication of bearings. It is very difficult to get satisfactory oil lubrication on motors designed for grease, as any master mechanic will testify. Field coils are now better supported in the motor, almost eliminating failures from grounded fields due to chafing. Brush-holders have been improved and creepage distances increased, which, with the use of commutating poles, has substantially reduced flashovers. Most street railway systems operate at 600 volts nominally, with peaks considerably above this. As most of the older motors were designed and insulated for 500 volts, this increase in voltage results in a high

mortality. Split-frame motors have given way to box frame; better fitting frame heads and bearing caps have replaced the old. These betterments are reflected not only in the direct repair expense, but indirectly in the increased yearly mileage due to less time spent in the repair shop.

Saves in Platform Expense Too

Many other improvements could be cited to show the greater reliability of the modern motor. The direct saving in maintenance will frequently show 20 to 25 per cent return on the cost of replacement, while the other savings may add considerably to this. A case in point is New Orleans, where it was found that by substituting modern machines a faster schedule could be operated, as the new motors were capable of more rapid acceleration and higher free running speeds, and that fewer cars with new motors could provide the same service with material economies in the cost for platform wages.

The reduction in weight that can be obtained by motor replacement, with the consequent saving in power cost and track maintenance, is appreciable and should be considered. One type of motor suitable for single-truck, two-motor cars weighs 1,500 lb., as compared to 2,850, 2,450, or 2,180 lb., respectively, for three of the older motors which it will replace. It is evident, therefore, that on a two-motor equipment, from 1,360 to 2700 lb. can be saved, and 2,750 to 5,400 lb. on a four-motor car. A still further reduction in weight can be secured by dropping the cars down onto low-wheel (24 in. to 26 in.) trucks and utilizing low-wheel motors. A saving of about 2,000 lb. per truck and 100 lb. per motor can be made in this manner.

The Winnipeg Electric Railway has done this with nearly 200 old cars, equipping them with 26-in. wheels and GE-258 motors. More recently the Dayton (Ohio) City Railway has re-equipped fifteen cars that had maximum traction trucks and two 65-hp. motors with 26 in. wheel trucks and four 25-hp., G.E.264 motors and saved considerable weight.

Summarized, there are many places where motor replacement can be justified by the reduction in maintenance expense and increased reliability of service. In other cases the ability to make a better schedule may be the determining factor. In others the necessity of pulling trailers may force the use of larger motors, while elsewhere the desirability of lowering step heights and reducing weight may bring about the motor replacement. There are without doubt similar conditions existing on most railways where the replacement of obsolete motors would bring material economies in addition to the saving in motor maintenance. It would well repay operators to give the situation on their own properties a thorough examination.

Food Costs Show 1 per Cent Increase

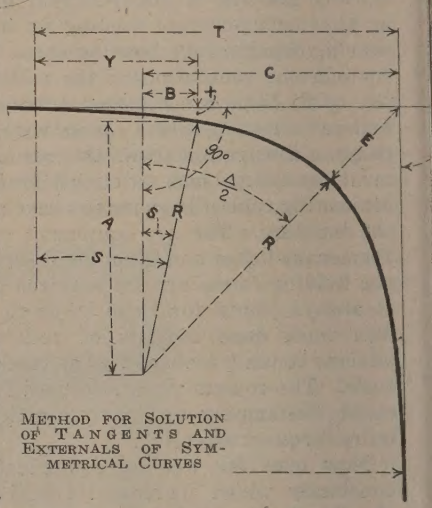
THE retail food index issued by the United States Department of Labor through the Bureau of Labor Statistics shows that there was an increase of 1 per cent in the retail cost of food to the average family in September as compared with August. For the year period Sept. 15, 1921, to Sept. 15, 1922, the percentage decrease in cost of all articles of food combined was 9 per cent. For the nine-year period Sept. 15, 1913, to Sept. 15, 1922, the increase in all articles of food combined was 36 per cent.

Solution for a Compound-Curve Trackwork Problem

A Simple Method for Finding the Tangents and Externals of Symmetrical Curves in Special Trackwork, Using Available Tables

BY L. R. BROWN
Office and Field Engineer New York State Railways, Rochester, N. Y.

FROM time to time there have appeared in the columns of this magazine formulas and methods for solving compound-curve problems. Since the advent of the standard spiral or switch easement, the most frequent problem encountered in the designing of special trackwork curves is the computation of the tangent distances and externals of curves where a standard spiral is used at either end of a given center radius. There are tables given by the steel companies which give the *X*, *Y*, *S* of each of their standard spirals. There is also a booklet put out by one company which gives tables showing these dimensions for the A.E.R.A. recommended spirals. Thus in nearly every case these dimensions as well as the center radius and total angle are known.



METHOD FOR SOLUTION OF TANGENTS AND EXTERNALS OF SYMMETRICAL CURVES

The problem, then, is to solve the tangent distances and externals. This problem, of course, is easily solved by trigonometry and there are several methods of doing it. Much time is wasted in the drafting room in computing these problems unless a given method already worked out and checked is used. If a copy of the formula is at hand it is only necessary to substitute in the formula. It likewise saves time in checking the computations.

The simplest method found by the writer for solving the above problem is that given by the following formula. This method can be used only where the same spiral is used on each end of the curve.

Given: X, Y, S of any spiral, R, the center radius, and Δ (see figure).

Find: T and E.

$$A = R \cos S$$

$$B = R \sin S$$

$$C = (A + X) \tan \frac{\Delta}{2}$$

$$E = \frac{A + X}{\cos \frac{\Delta}{2}} - R$$

$$T = C + Y - B$$

In the Jan. 17, 1920, issue of the *Electric Railway Journal* the writer gave formulas which could be used for solving the X and Y distances of any spiral in case a railway company used a standard spiral of its own instead of already existing standards.

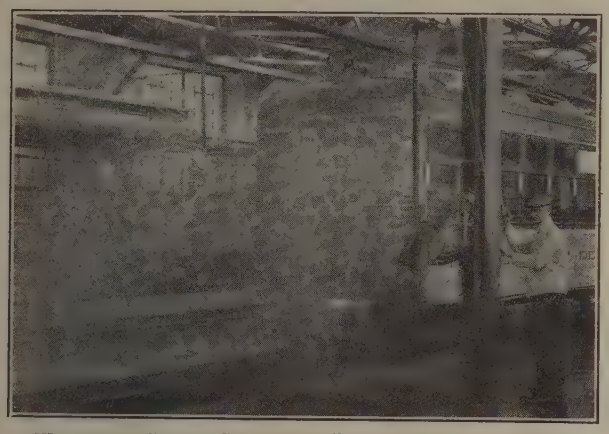
Equipment and Its Maintenance

Short Descriptions and Details of New Apparatus of Interest to the Industry. Mechanical and Electrical Practices of All Departments

Efficient Method for Washing Cars

The New Carhouse of the Detroit Municipal Railways Is Equipped with Perforated Pipes, from Which a Spray Is Applied to the Car Bodies as They Are Operated Back and Forth

AMONG the novel features incorporated in the new St. Jean carhouse of the Department of Street Railways, Detroit, is a spray system for washing cars. It consists of four perforated vertical spray pipes, arranged in two pairs. These are located at the sides of the washing track. A 2-in. pipe is used as the main feed pipe, and this is reduced to 1½ in. at the control valve, and below this to 1¼ in. at the regulating valve and then to 1 in. and ¾ in. at the bottom. Two rows of holes are provided in the bottom sections, with 1-in. centers at the top and ¾-in. centers at the bottom. All holes are 0.082 in. in diameter. The water for washing is taken directly from the fire line of the shop. To provide for cars of different heights, a slotted bushing is placed over the upper portion of the spray pipe. When the slot is turned away from the holes, the latter are covered, thus preventing the water from shooting over the roofs of low cars.



WASHING A SAFETY CAR IN THE DETROIT MUNICIPAL SHOPS

In washing a car it is moved slowly between the first pair of spray pipes, and in order to loosen the dirt the car is stopped while two men with long-handled brushes go over the car on each side. With the dirt loosened, the car is moved slowly past the second pair of sprayers, which rinses the car clean. The safety cars of the Detroit Municipal Railways have hinged metal window guards, which can be turned down out of the way while washing is being done.

The valves for operating and controlling the flow of water are manipulated from the floor by means of ropes. The washing crew consists of four men, one of whom operates the valves. As soon as the car has passed through, this man helps with the washing. The motorman stays inside the car during the washing and takes it away immediately after the job is finished. This method enables the washing of a safety car to be done in two and a half minutes, and its use has resulted in reducing the cost of car washing to a considerable extent. This equipment was devised by Fred Weld, master mechanic of the system.

Trailers Converted to Motor Cars

BY GEORGE R. GREEN
Superintendent of Equipment Chicago, South Bend & Northern Indiana Railway, South Bend, Ind.

THE Chicago, South Bend & Northern Indiana Railway, South Bend, Ind., is now engaged in rebuilding and equipping ten second-hand trailers, to be operated as one-man motor cars. Five of them have already been converted into motor cars at a cost of $2,158 each, exclusive of the cost of the motors and controllers, which the company had on hand. The cars are 41 ft. 8 in. in length over all and seat forty passengers. They have Brill trucks, two 40-hp. motors, 30-in. wheels and DH-16 compressors. The weight of the cars has been kept down to approximately 30,000 lb., every precaution having been taken to remove any surplus material.

The cars are arranged for double-end operation, but have single doors manually controlled. The company's experience with doors has shown that while it takes a slightly longer time to load and unload passengers during peak-load riding, yet the operator has far better control of the boarding and alighting of passengers with the single door. On the remodeled car the rear door is held in a closed position by a magnetic pneumatic locking device which is controlled by the circuit breaker on the operating end of the car.

TEN TRAIL CARS LIKE THE ONE SHOWN AT THE LEFT ARE BEING CONVERTED INTO ONE-MAN MOTOR CARS, OF WHICH THE ONE IN THE VIEW ON THE RIGHT IS A SAMPLE

Besides the addition of the motors, control and electrical equipment to the trailers, the rehabilitation work consisted chiefly in the elimination of the rear doors, the addition of window guards and painting of both the inside and outside of the car body. When these ten cars are completed and put in service the railway will have twenty cars of this type available.

Convenient Circuit Breaker Testing Outfit

The Indiana, Columbus & Eastern Traction Company Uses a Portable Outfit in Connection With the Standard Car Equipment for Setting Circuit Breakers

BY F. J. FOOTE
Superintendent of Motive Power and Equipment, Indiana, Columbus & Eastern Traction Company, Springfield Ohio

ANY ONE who has operated an electric car, or has stood by a motorman during his efforts to get a car over the road on time against adverse conditions, such as poor power, bad grades, slippery rails, etc., can appreciate the temptation to fast feeding when the need arises. This fast feeding is rarely justified, however, as it usually results in damage to the equipment. The most effective protectives against too rapid feeding are the fuse and circuit breaker. To a considerable extent the fuse has been superseded by the overload circuit breaker. The kind that is mounted under the car and the opening of which cannot be prevented by the motorman is in greatest favor among equipment men. This type of breaker, set to open at the proper current, and when kept in good order, gives excellent protection to the motors and controllers.

TESTING OUTFIT CONNECTED TO CAR READY FOR TEST

The question as to the proper current at which a car breaker should open will not receive the same answer from different equipment men, but the writer has found that the most satisfactory value for this is just enough to get the car up the grades existing in the district where the car is used, when the car equipment is in good order and properly operated. This current must be found by trial for each type of car. I have found that with a 44-ton passenger coach with four 100-hp. motors, 36-in. wheels and a gear ratio of 25:52 900 amp. is just about right.

Testing a circuit breaker is a very simple matter if one has at hand a source of current, a variable resistance, and a testing ammeter of proper capacity. However, many shops are not equipped with this apparatus, the shop over which the writer presides being one of these. It has been our ambition for some time to devise a method for testing the breakers on our cars, and a short time ago the writer conceived the idea that it would be possible to rig up an inexpensive device which could be used in connection with the resistance on the car itself, and the circuit breaker could thus be tested without removing it from car. With this in mind, the C.B. testing outfit shown in the accompanying illustration was made, mostly from old material found around the shop.

The outfit consists of a 1,200-amp. switchboard type ammeter, a G.E.-M.K. circuit breaker set at about 1,200 amp. for safety, a bank of cast-iron grid resistors, and part of an old L-4 controller—the whole being mounted on a low wheeled truck. (The 1,200-amp. circuit breaker is only supposed to open in case the car circuit breaker is stuck.) The resistance consists of thirty-six grids, No. N-3355, two in multiple, divided into six equal sections or steps, and connected to the controller fingers in such a way as to be cut out successively as the controller is fed up.

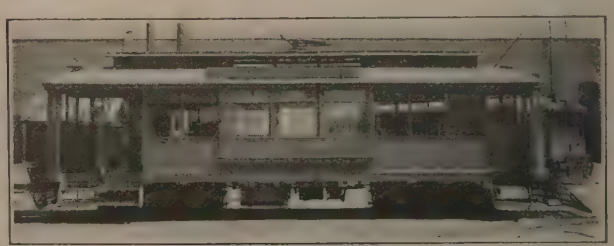
This outfit is provided with one incoming and one outgoing flexible cable, of ample capacity, attached to long poles and provided with stiff copper hooks at the terminals. In use the trolley pole of the car is fastened down, the incoming cable is hooked over the trolley wire, and the outgoing cable is hooked over the trolley wheel of the car. The air brakes are then set, and the car controller is fed up by a man on the car till the ammeter shows from 60 per cent to 75 per cent of the desired current, then the man at the testing outfit at once begins to feed up slowly till the car breaker opens, or the desired current is exceeded, in which case the breaker on the testing outfit is tripped and the car breaker is adjusted for lower current. The operation is then repeated, adjusting the car breaker each time till it opens at or near the prescribed current. By this method many defective circuit breakers have been discovered, some of which could hardly be opened with a crowbar.

This testing outfit has been found satisfactory beyond the writer's expectations, on account of its inexpensiveness, ease and rapidity of operation and practicability. It is not uncommon to test a car breaker and make the necessary adjustments complete in twenty minutes.

The advantage of having the outfit on a truck is that it may be taken to a car, thus doing away with the necessity for switching the car onto a track where the outfit is located, which at times may be very inconvenient.

Car Reconstruction in Los Angeles

AS A PART of its program for reconstructing cars, the Los Angeles Railway has recently lengthened one of its 35-ft. cars seating thirty-four passengers so as to provide a car 48 ft. long, with a seating capac-



CAR BEFORE RECONSTRUCTION

RECONSTRUCTED CAR READY FOR SERVICE

ity of fifty-six. In this reconstruction the car was cut in two parts at the middle and the center section was enlarged, leaving the ends as they were originally. The center section is inclosed and the two end sections are open. In the reconstructed car cross-seats are provided throughout. The original car had longitudinal seats in the inside section. The seats are located opposite the windows and a signal push button is provided for each seat. Two-motor equipment is used.

The original car was equipped with magnetic brakes and was used in service on one of the hill lines. The reconstructed car has been provided with air brakes. An additional trolley pole has also been added, as was found necessary for the longer car. The clerestory of the old car, which was of monitor deck type, was removed and an arch roof was substituted. The original weight of the car was 33,000 lb. and the reconstructed car weighs 39,000 lb. The reconstruction was carried out by P. B. Harris, chief engineer of the company.

Insuring that Couplers Couple

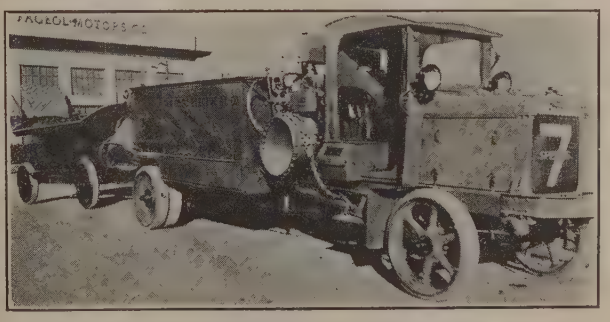
AS A literal link in the assurance that all equipment is in the safest possible condition for operation, the Cleveland (Ohio) Railway tests all couplers after any repairs on them have been made. Oftentimes the adjustment is disturbed when each surface of the two halves of a coupler have been machined. Also the working of the coupler may be imperfect because of a replacement of the tongue or the building up of the old one by welding. For that reason, the device shown in the accompanying view has been found effective in discovering defective couplers. One half of the coupler is pinned to the frame, while the other half is attached to the piston of an air cylinder bolted to the other end of the frame. Full shop air pressure of 100 lb. per square inch is admitted to the cylinder through the conductor's valve, the pull on the coupler thus established being much greater than ever will be encountered in actual operation. During the test the air is released from the cylinder and the two halves drawn apart and coupled several times to insure as well that all parts are in perfect working condition.

ALL COUPLERS OF THE CLEVELAND RAILWAY ARE GIVEN A TENSION AND LOCKING TEST AFTER BEING REPAIRED

Novel Highway Maintenance Truck

THE San Diego Electric Railway has recently placed a novel highway maintenance truck and trailer in operation. The truck carries all tools and material needed for the care of concrete, asphalt, macadam or dirt roads, for erecting concrete steel or wooden bridges, and for repairing or painting fences.

The truck is equipped with a concrete mixer, air compressor, centrifugal pump with self-priming device, and lengths of suction hose for filling the water tank from wells or rivers. The compressor has twin cylinders, and is driven by a belt from the forward drive shaft. A large air reservoir is mounted just behind the operator's cab and combination material bins are provided so that 1,000 lb. of cement, a cubic yard of sand, two cubic yards of gravel or rock can be carried. All bins have gravity feed to the mixing apron which is controlled by hand-operated gates.



HIGHWAY MAINTENANCE TRUCK AND TRAILER

The motor hauls a trailer which is specially designed with a side dump body for carrying rock, sand or other material. Other equipment includes a tar or road oil heating tank with gas furnace having a capacity of 50 gal., and a syphon nozzle for spraying the hot tar or oil under pressure with a hose. There are also a complete paint-spraying outfit with hose connection and a pneumatic rotary post hole digger with hose. The truck was manufactured by the Fageol Motors Company, Oakland, Calif.

Essentials of Carbon Brush Selection

High-Grade Brushes May Fail to Give Satisfactory Service Unless Brush-holder, Commutators and Motor Windings Are Kept in Proper Condition

BY W. J. OVERMAN

Railway Department, General Electric Company, Boston, Mass.

THE most sensitive parts of a railway motor, and in many cases the most neglected parts, are the brush-holders, brushes and commutators. While as a rule the same general practice in the care of the parts can be carried out on all properties, still in many cases there are conditions to be met which require considerable study on the part of the operator in order to obtain good motor performance.

The selection of brushes is of primary importance, but it must be remembered that even with brushes best suited to a particular type of motor, good results cannot be obtained unless proper care is given to other parts. Railway motors in their development have gone through stages which have given the various classes commutating characteristics quite different.

There are few of the non-commutating pole motors with commutators having flush mica now in service, but it must be realized that the brush selected for this type must contain enough abrasive to keep the mica cut down flush with the copper. The brush must also have a fairly high ohmic resistance to keep down the flow of current from bar to bar through the brush. This flow of current is caused by the difference of potential between commutator bars under the brush and increases in intensity as the electrical neutral shifts away from the brush. The motor manufacturers recommend a particular brush for this type of motor, having very little graphite and considerable abrasive material.

The non-commutating pole motor with undercut mica permits the use of a brush having little abrasive qualities and a much larger percentage of graphite than the brush recommended for non-slotted commutators. The brush must have a high ohmic resistance, however, as this type of motor has no commutating poles to prevent shifting of the electrical neutral.

Commutating poles introduce a counter emf. and the tendency for current to flow from one commutator bar to another through the brush is almost entirely eliminated. This permits the use of a highly graphitized brush having good lubricating qualities and a high current carrying capacity. The brush, being very soft, has slight scouring effect, and is rapidly destroyed by rough commutators, but when correctly applied, will cause practically no commutator wear, and will, in this way, effect considerable saving. With a few exceptions, a brush of this character can be used on all commutating pole railway motors. Tapped field railway motors sometimes require a brush similar to that used in non-commutating pole slotted commutator motors due to increased sparking which roughens the commutator.

From the foregoing paragraphs, it is evident that there is a reason for selecting a certain kind of brush for a certain type motor and that brushes should not be selected in a haphazard manner. Quality should be considered as of primary importance instead of price. A cheap grade of brush, even though containing a large amount of graphite, may have very poor lubricating qualities due to the use of cheap graphite.

The very best brushes may fail to give good results unless the motor is in good condition. Brush-holders should, of course, be in the correct position. With modern motors it is difficult to set the holders out of electrical central, but their position should be watched on some of the older types. The bottom of the brush-holder slot should be about $\frac{1}{16}$ in. from the face of the commutator and the brush-holder slot should not be allowed to become badly worn. This will allow the brush to shift, which sometimes causes poor commutation and broken brushes.

The pressure on the brush is very important and no definite recommendations as to the amount of pressure can be given, as it depends upon many variables. In order to prevent sparking, it must be great enough to prevent the brush from jolting away from the commutator under all operating conditions. Worn bearings, rough track and special trackwork and broken suspension springs all cause jarring of the motor, and this jarring is greatly aggravated in cold weather, due to lack of resiliency in the ground and track. A pressure greater than necessary naturally results in unnecessary wear, but sometimes operators find it necessary to increase the pressure to as much as 9 lb. per brush before good results can be obtained. Under such conditions, it is important to use the very best quality of brush obtainable in order to prevent excessive wear.

Many operators, on examining commutators which need turning, immediately attribute the trouble to mechanical wear and recommend decreasing the brush pressure. Sometimes serious mistakes are made in this way, and the commutator should be very carefully examined to determine whether it has been burned down or scoured down. A burned commutator usually has a blackened and roughened surface, while a rapidly worn commutator usually has a bright surface and is sometimes grooved. All slotted commutators, if equipped with proper brushes, will burn down rapidly after having worn down to the mica, and they should be removed, turned and reslotted before reaching that stage. If upon careful examination it is determined that the commutator has been scoured down, it should then be determined whether or not the proper brush is being used before decreasing the brush pressure. If the proper brush is being used, sandy or dusty roadbeds may be contributing to the trouble, particularly if the motor is the ventilated type. Brush pressures should rarely be less than 5 lb. per brush on any motor.

Some operators find it difficult to use the highly graphitized brushes recommended for modern commutating pole motors, but in most cases the difficulty may be readily overcome. It must be remembered that graphitized brushes will stick in the holders and give very little satisfaction if the bearing oil is allowed to get over into the motor casing where it may be thrown on the brushes. It is poor practice to allow such carelessness for other reasons as well, and it always results in dirty and grounded brush-holder insulated studs. It must also be remembered that brushes having good lubricating qualities have very poor abrasive qualities, and soft brushes will not smooth up rough commutators. On the contrary, the brushes themselves will be rapidly worn away and the brush of this type is very likely to be condemned for being too soft.

Highly graphitized brushes have been known to wear out in less than a day's running on commutators just out of the shop. To all appearances the commutators were smooth, and in the case which the writer has in mind, the brushes were condemned and brushes having less lubricating qualities were put in their place. The results were somewhat better, but not by any means

satisfactory, and a further investigation was made. Upon examining the commutators with a reading glass, it was found that the sharp edges had never been removed from the commutator bars after the slotting process. The soft brushes were not abrasive enough to remove these edges of the bars and the result was that the brushes were rapidly scraped away. The trouble was easily remedied by drawing a "V" shaped tool through each slot between the bars and then sanding the commutator. No doubt the short life of many brushes could be traced to just such a neglect of detail.

Proper selection of brushes and proper care of the parts will effect considerable saving, and attention to these details is almost as important as keeping the bearings supplied with oil.

Letters to the Editors

Way Committee Report on Substitute Ties

BROOKLYN RAPID TRANSIT COMPANY,
BROOKLYN, N. Y., Oct. 26, 1922.

To the Editors:

Your editorial in the *Journal* for Oct. 7 on the subject of substitute ties seems to call for comment, particularly as criticisms of the way committee report on substitute ties is implied.

In the first place the report was clearly a progress report and I believe it is an error to indicate as you do that the sole basis of the report was replies from a questionnaire. There were other bases, such as the general experience of the committee members, many of whom have used and are using substitute ties in several forms. Some of the members have also had opportunity to observe the performances of substitute ties in cases where these ties have been removed for one reason or another. It is not surprising that you as well as others seem to err in thinking that the report was discussing forms of steel ties in particular, although it happens that most substitute ties used by electric railways have been in some form of steel. To take up your numbered criticisms in some detail:

1. The reference to incasement of ties in concrete, I believe, was intended to cover the use of wood ties, as it is well known that such an incasement of wood ties does protect them and prolong their life.

2. It is not clear to me that the use of substitute ties in most forms may not call for an added investment and there is a question as to savings effected unless some particular substitute tie is under review, and there is doubt that savings for some of these can always be had under all conditions of installations. The committee was not discussing "selling features."

3. The word "thoroughly" was inserted for the purpose of clearness and I note you interpreted it correctly. I believe the committee will search some time before it will find a substitute tie which will have most of the virtues of the wood tie. The latter is ideal in all but two points, viz., the ultimate decay and scarcity.

The steam roads are still searching for the proper form of substitute tie.

4. There is the ultimate maintenance cost of track to be considered. I believe any substitute tie which, as part of a substructure, cannot readily be adjusted when settlements occur, which cannot take another set of rails without causing a great deal of labor expense, and without leaving uncertainty as to how well the rails may be refastened, should be considered as not fulfilling the functions of an ideal substitute for the wood ties.

5. It is to be regretted that you referred to steel ties in your discussion. Assuming that the electric railways operate 40,000 miles of single track, there must be about 105,000,000 wood ties in use. There are perhaps 950 electric railway companies in the country. It is noted that 140 of them have used some form of substitute ties. Meanwhile it is understood that one of the largest users has this year installed only between 1 and 5 per cent of its former annual number, because of a reversion to the use of wood ties.

The report cannot well be taken to reflect upon any present form of substitute tie and was not so intended. It has at least done one thing, viz., created an interest in the study of a subject which is of constantly increasing importance to the industry.

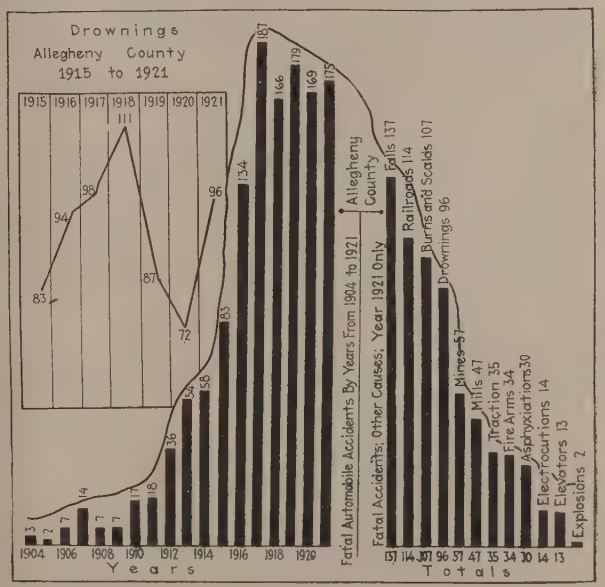
The forms of substitute tie in current use have merit for use under a number of special conditions, and for this purpose some of them have been used in Brooklyn at times and further use is even now under discussion for specific conditions.

R. C. CRAM,
Engineer Surface Roadway and Sponsor for Committee on Way Matters for 1921-22.

Automobile Accidents Increase

CECIL G. RICE, ex-president American Electric Railway Claims Association, has been compiling statistics of accidents in Allegheny County, Pa., and among the results of these studies is the accompanying chart. With other figures compiled by Mr. Rice it has attracted considerable attention in the Pittsburgh daily papers.

The diagram at the left shows drownings for the last seven years, the reduction coming largely, in Mr.



ANOTHER LUMP TO REMOVE

Rice's opinion, through greater vigilance at the beaches. A more interesting chart from a railway standpoint is the larger one illustrating the fatal automobile accidents by years from 1904 to 1921 and those from other causes for 1921 only. The remedy for automobile accidents in Mr. Rice's opinion is stricter examination of drivers before licenses are issued and stricter enforcement of the automobile laws against reckless driving.

Tests Used in Selecting Employees*

Detailed Study Made by the Market Street Railway, San Francisco, in the Nature of Research as to What Scientific Methods May Be Employed to Aid in Selecting Good Employees Is Here Presented

By M. McCants
Assistant General Manager Market Street Railway, San Francisco, Calif.

BELOW are the results of studies made under the direction of the research committee of the Market Street Railway of San Francisco. Of these studies those portions are included which have the most direct bearing on the report of the A.E.R.A. committee on personnel and training of transportation department employees.

Analysis of Best and Poorest Motormen

The research committee authorized direct contact with and study of about twenty-five of the best motormen in all divisions and about twenty-five of the poorest motormen in all divisions. Subsequently, five division superintendents were each asked to submit the names of the five best and the five poorest motormen in their respective divisions and to furnish certain personal information concerning each of them. In addition, the employment department was asked to furnish data from the application blanks of these motormen.

From April 4 to April 9 one of our men interviewed and gave standardized intelligence tests to groups of the selected motormen at their respective headquarters. Of the selected list of forty-nine, two were absent and could not be tested.

The materials forming the basis of this report consist of: (1) data from the application blanks of the selected men; (2) additional personal information furnished by the division superintendents, and (3) results obtained with general intelligence tests.

The plan of this report was to analyze all the above-mentioned data to determine what value, if any, each item may have in differentiating the best from the poorest motormen, and to point out the most significant facts to be considered in the selection of applicants.

Application Blank

The primary function of an application blank is to obtain facts which will aid in the selection of the best fitted applicants. For this reason various items on the application blank will be taken up one by one to determine what value they may have in differentiating the best from the poorest motormen. The data studied are from the application blanks of twenty-four best and twenty-four poorest men.

Twenty of the best men were citizens when hired, as were also sixteen of the poorest. This bit of evidence, therefore, does not indicate that the item is of very great value in hiring motormen. Other statistics, such as married or single, color of eyes, hair, etc., with comments on the results, are given in the accompanying tables.

Married or Single

	Best	Poorest
Married	14	12
Single	10	11

There is the merest shade of preference in favor of the married man.

Previous Occupation

	Best	Poorest		Poorest
Laborer	5	4	Special officer	1
Farmer	3	1	Restaurateur	1
Motorman	1	1	Boiler maker	1
Carpenter	1	1	Millman	1
Salesman	1	1	Gardener	1
Miner	2	..	Dairyman	1
Soldier	2	..	Engine driver	1
Real estate	1	..	Grocer	1
Machinist	1	..	Railroad employee	1
Teamster	1	..	Stock raiser	1
Lineman	1	..	Car cleaner	1
Grocery clerk	1	..	Janitor	1
Locomotive engineer	1	..	Hotel clerk	1
			Mechanic	1
Watchman	1	..	Cannery foreman	1
Butcher	1	..	Construction foreman	1
Oil worker	1	..		

A careful scrutiny of the list of occupations from which these motormen have been drawn reveals no evidence of value in determining whether an applicant will become one of the best motormen.

Complexion

	Best	Poorest
Dark	7	10
Fair	8	3
Medium	4	5
Ruddy	4	5
Sallow	0	1

These facts do not indicate that complexion has value in selecting suitable candidates.

Color of Eyes

	Best	Poorest
Blue	9	10
Brown	7	8
Gray	5	2
Hazel	2	2
Dark brown	0	2
Light brown	1	0

The above figures certainly do not give much weight to this item on the application blank.

Color of Hair

	Best	Poorest
Dark brown	9	9
Black	4	9
Brown	4	3
Medium gray	3	2
Light brown	2	1
Auburn	1	0
Red	1	0

Such facts as these would not indicate that this item (color of hair) has very great value in differentiating the applicants.

Weight

Pounds	Best	Poorest
190 to 230	6	1
180 to 189	4	4
170 to 179	1	3
160 to 169	7	7
150 to 159	4	5
140 to 149	1	2
125 to 139	1	2

The best men range from 230 to 135 lb., with the median at 167½ lb. The poorest men range from 197 to 125 lb., with the median at 162 lb. Apparently weight has little to do with the candidate's fitness for the job.

Height

Inches	Best	Poorest	Inches	Best	Poorest
74	1	1	68	6	1
72	2	1	67	1	4
71	2	2	66	0	4
70	4	4	65	0	3
69	8	2	64	0	2

Judging solely from the above statistics a motorman should not be less than 67 in. tall. The most obvious explanation presenting itself is that the short man is not in a position to have the widest field of vision; again, his lack of height may handicap him in the proper operation of the car. At any rate, if the company had set a minimum height of 67 in., nine of these poorest motormen and none of the best would have been rejected. With a minimum of 68 in. only one of the best and thirteen of the poorest would have been rejected.

Briefly, if further investigation continues to reveal such facts as these, the employment bureau will have a simple means of eliminating outright many unsuitable applicants.

Age at Beginning

Age	Best	Poorest	Age	Best	Poorest
51	..	1	33	1	..
48	1	..	32	2	..
46	..	1	30	1	..
43	..	1	29	1	1
42	..	2	28	1	..
40	..	2	27	1	2
39	1	2	26	2	..
38	..	1	25	1	..
37	1	3	24	1	2
36	1	3	23	3	1
35	1	..	22	2	..
34	3	2	..	..	..

From the above array of figures it may be seen that in age when beginning to learn car operation, the group of best men ranges from twenty-two to forty-eight years, with the median at thirty-one years, while the group of poorest men ranges from twenty-three to fifty-one years with the median at thirty-seven years. If the employment office had rejected all inexperienced applicants above thirty-six years, all of the best men except three would have been hired and thirteen of the poorest men would have been eliminated.

Such facts seem to indicate that the older men are not likely to develop into the best motormen. If continued in-

Dependents

	Best	Poorest
Wife	4	3
Wife and one child	3	5
Wife and two children	3	0
Wife and three or more children	4	3
Mother	3	2
Father	0	2
Father and mother	0	1
Four children	0	1
No dependents	7	7

Judged from the above facts, the case appears that the best and poorest are about equally blessed with dependents, and those who have no dependents at all are equally divided between the best and the poorest groups.

*Abstract of appendices to paper on "Selection and Training of Employees" presented by Mr. McCants before the annual convention of the American Electric Railway Transportation & Traffic Association, Chicago, Oct. 2-5, 1922, and printed on page 679 of the Oct. 21 issue of *Electric Railway Journal*.

vestigation bears out this fact the next step would be to set a definite maximum limit which would, of course, not be made public; otherwise the applicant would be tempted to make mis-statements.

At the time of application every man denied that he used alcoholics; consequently, this item had no value in differentiating the two groups.

If the applicants born in Ireland, Greece and Italy had been rejected, ten of the poorest group and none of the best would have been eliminated.

The items of the application blank which, from a study of the two selected groups, seem to have value in distinguishing between the best and poorest men, are: (1) Height, (2) age at beginning, and (3) place of birth. The other items seem to be quite devoid of value. At present the foregoing items constitute the chief sources of information upon which the inspector of applicants must rely in making his selections. If this analysis is conclusive, it would appear that only three out of the score or more of items on the blank are safe guides.

Information from Divisions

Of the informational items furnished by the division superintendents, only a portion throw any light on the problem of setting up distinctions between the two groups of the best and the poorest.

Thirteen of the best and five of the poorest own real estate in some form. Possibly the poorer group would improve its showing if it were to continue in the service of the company for a period of time equal to that of the better group.

Nationality

	Best	Poorest
American	17	9
English	2	1
German	1	2
Danish	1	..
Canadian	1	..
Welsh	1	..
Russian Jewish	1	..
Italian	..	3
Greek	..	3
Irish	..	3
Portuguese	..	2
Dutch	..	1
Syrian	..	1

From these figures it would appear that the Mediterranean races and the Irish afford poor material for motormen. Beyond that, nationality seems to play but little part.

Nationality of Grandparents

	Best	Poorest
Scotch	7	..
Welsh	4	..
Danish	5	..
Russian Jewish	4	..
American	45	12
English	9	10
French	3	9
German	13	10
Dutch	1	4
Portuguese	2	8
Irish	3	17
Italian	..	12
Greek	..	12
Syrian	..	4
Bohemian	..	4
Polish	..	2
Spanish	..	2

It seems from a study of the above figures that nationality of grandparents is more significant than the applicant considered his own nationality to be. Here again the Mediterranean races and the Irish are to be found predominantly in the group of poorest.

Insurance

	Best	Poorest
$2,000 or more	3	2
$1,000 to $1,900	5	5
$500 to $900	3	0
$100	1	1
Accident only	1	1
None	13	17
Total amount carried (not including accident or company insurance)	$11,500	$7,300

It seems that the group of best carries the more insurance. This might be explained by the fact that the group of best has had longer steady employment with the company and has therefore more money to spend for insurance.

Entire Wealth

	Best	Poorest
$5,000 or more	5	3
$2,000 to $4,500	10	2
$1,000 to $1,500	3	2
$200 to $900	1	6
Undetermined	5	4
None	0	7

The median man of the best group has a financial wealth between $2,000 and $4,500 while the median of the poorest group is between $200 and $900. It is doubtful, however, if these facts have much value for the employment department except to indicate that the men who make the best motormen are the sort of men who accumulate more wealth than do the poorest motormen.

It was suggested by members of the research committee that financial worry tends to cause accidents. This opinion seems to have some basis as the poorest group has at least four cases, while the best group affords not a single instance.

Although both groups spent about the same amount of time in school (the median age at quitting school being fifteen years), the best group made a considerably better showing in that its median is the eighth grade, while the poorest group advanced only to the fifth grade. This is a very significant fact for it indicates the relative ability of the two groups. That native ability which enables one group to get into the eighth grade in the same length of time that the other group gets into the fifth grade enables the best group to develop into better motormen.

Four of the best group and six of the poorest group are reported to be somewhat given to the drinking habit.

Domestic infelicity is mentioned in connection with three of the poorest group, while none of the best group is so reported. Other statistics appear in the accompanying tables.

As a summary of the information from divisions, it might be said that the best group are more largely drawn from American or North European stock, while the poorest group tends to be drawn from Mediterranean and Irish stock. The best group carries more insurance, owns more real property, possesses greater total wealth and completes more school grades in the same time. The poorest group furnishes the only serious cases of domestic infelicity and of financial worry.

It may be safe to infer from all these facts that the one group is superior to the other because it is composed, on the whole, of better all-around men, and that motormen are not born, but are made of good substantial human material.

The mental tests were used to discover if general intelligence bore any relation to success as a motorman. The amount of schooling was not the question at point, but, rather, natural ability, native capacity, the power to grasp new situations.

The tests employed are well standardized and would fit in conveniently as a part of the routine procedure in the employment department. They can be given simultaneously to a group as well as to a single individual. The men with little schooling were given only tests in which their lack of education was not a handicap.

Table I shows the comparative standings of all the men who took the tests. It will be seen that Motorman 139 achieved 98 per cent, which means that in general mental grasp and ability to learn he stands higher than 97 per cent of the adult population of this city. The standings of the best group range from 98 to 26, the latter standing being made by Motorman 124.

It is important to note that fourteen of the poorest group (or more than half) fell below the lowest man of the best group. In other words, fourteen of the twenty-three in the poorest group tested ranged from 23 per cent

TABLE I—INTELLIGENCE RATINGS

Best				Poorest		
B	C	D	A	B	C	D
139	37	69	98	...	...	...
119	30	72	94	...	...	...
130	32	70	93	...	...	...
...	...	...	83	103	(39)	67
112	32	67	80	144	24	(66)
117	23	72	79	...	...	...
122	28	68	79	...	...	...
145	(39)	69	78	...	...	...
...	...	...	76	125	(51)	67
143	36	68	75	...	...	...
107	29	69	66	...	...	...
!	..	..	65	140	37	69
116	26	70	64	...	...	...
...	..	..	53	131	36	(64)
...	..	..	52	109	(39)	69
146	22	71	50	...	...	...
129	34	71	50	...	...	...
127	23	69	49	...	...	...
...	..	..	40	138	27	(66)
...	..	..	36	136	(38)	71
132	34	68	35	...	...	...
105	24	68	34	...	...	...
133	(48)	69	33	141	24	74

Best				Poorest		
B	C	D	A	B	C	D
108	34	68	33	...	...	.
106	33	68	30	.		
120	27	74	29	.		
135	23	69	29	.		
113	35	70	28	...	.	
101	25	70	27	...	.	
137	22	69	27	...	.	
124	26	69	26	...	...	
...	..	..	23	110	43	(65)
...	.	..	21	104	(46)	(65)
.	.	.	21	114	34	67
...	.	.	20	142	(40)	72
...	..	.	19	134	36	70
.	.	.	18	126	23	70
...	.	.	17	115	36	(64)
...	.	.	16	147	(40)	71
...	..	..	15	111	(42)	70
.	.	..	12	118	27	(66)
.	..	..	11	128	34	68
...	..	..	8	123	(42)	(66)
...	..	..	8	121	37	(65)
.	..	..	4	102	29	70
.	..	..	.	...	...	...

Legend:

A—Intelligence percentage.
B—Key number of motorman.
C—Age at beginning (breaking in).
D—Height in inches.

The group of best are at the left of Column A, while the group of poorest are at the right.

The figures in parentheses indicate disqualification by the following assumed standards:

1. Not over 37 years at beginning.
2. Not less than 67 inches tall.

All below the twenty-fifth intelligence per cent are also disqualified.

to 4 per cent, and not one of the best group fell so low.

It would seem advisable to inquire further into the cases of motormen from the poorest group who did as well on the tests as did the best group. If we may apply the findings from the analysis of the application blanks and take as a maximum age thirty-seven years, and as a minimum height 67 in., all of these exceptional cases may be explained.

Motorman 103 was too old, thirty-nine, when he broke in, and had been trained in newspaper work, which is quite different from his present occupation. Besides, he is worried over financial losses in Mexico.

Motorman 144 has been in the service less than a year and his division superintendent states that he may be expected to develop into a good man. It is to be noted that he is only 66 in. tall.

Motorman 125 was fifty-one years old when he broke in.

Motorman 140 has domestic troubles in that his wife deserted him, leaving him the care of four children.

Motorman 131 has had less than a year of experience and he is only 64 in. tall, or 3 in. less than the assumed minimum.

Motorman 109 broke in at the age of thirty-nine; however, his division superintendent classes him in the middle one-third of his men, and not as one of the poorest as he was originally supposed to be classed.

Motorman 138 has the financial worries induced by an extravagant wife. In addition, he is only 66 in. tall.

Motorman 136 was formerly a salesman. He drinks and is classed as being one of the least contented of all the men. His division superintendent makes this comment: "Knows how, but is very obstinate." He was thirty-eight years old when he broke in.

Motorman 141 is an Irishman who is said to be independent and quarrelsome. He has to be "treated rough." He is ranked as being the least contented of the men studied in that division.

General intelligence can be gaged fairly well by means of tests, but there are other important qualities for which there are no quick, direct employment tests available. However, there is good reason to believe that, in general, desirable human qualities tend to go together; in fact, careful research in the national army resulted in the conclusion that the best single criterion in classifying men for general value was general intelligence as measured by tests, and this study indicates that the same rule holds true for motormen.

Qualities Compared

In order to determine how well standing in intelligence corresponds (correlates) with standing in other desirable traits and also with standing in the performance of duties, each division superintendent was asked to rank his men (those tested) in each of the traits and in each of the duties. These rankings were correlated with the rankings in intelligence and Table II and Table III were prepared from the results.

A careful study of Table II will reveal the fact that there is a positive correlation between intelligence and other traits desirable in a motorman; or, in other words, the brighter a man is (as shown by tests) the more likely it is that he stands high in other traits—even such traits as contentment and loyalty.

A study of Table III bears out the conclusion that general intelligence and the performance of duties have a positive correlation. Column J of this table indicates that intelligence (as tested) is a positive factor in the very important duty of avoiding accidents.

Although the division superintendents were asked to rank these motormen in inherent traits, i.e., inborn traits which can be only slightly modified, if at all, by discipline or education, it is quite apparent in Table IV that the ranking was very considerably biased by length of experience as motorman. Such biases are an actual hindrance in the investigation, for what the employment department needs are facts which will help in analyzing the inexperienced applicant.

Fortunately, however, it was possible to use the method of partial correlation to determine the correlation of intelligence with traits after the bias of experience had been eliminated. This method of partial correlation threw considerable light on the rating skill of each division superintendent.

Superintendent DS-A appears to have been very considerably influenced by the experience of the men he rated. After the influence of this factor is eliminated the correlation between intelligence and traits becomes quite marked (.53). Only one other man is more greatly influenced by length of experience.

It is almost certain that Superintendent DS-B depended practically entirely upon the length of experience of the men he ranked. Since it so happened that no relation existed between experience and intelligence, the elimination of the former factor could have no possible effect upon the correlation of the latter with traits. Consequently, no weight whatever can be attached to the intelligence correlation figures for this superintendent. The validity of the statements in this paragraph are borne out by the admission of the superintendent himself.

Superintendent DS-C was less influenced by length of experience and consequently a higher correlation is found for intelligence.

Superintendent DS-D is still less influenced by experience and as might be expected there is a high correlation between intelligence and desirable traits.

Superintendent DS-E is influenced by experience least of all as his bottom figure in Table IV shows. For his division, also, there is a high correlation for intelligence.

It has been assumed by some persons

TABLE II—SHOWING THE CORRELATION BETWEEN RANKING IN GENERAL INTELLIGENCE (AS TESTED) AND RANKING IN THE POSSESSION OF DESIRABLE TRAITS

Division Superintendent	Correlation Coefficients													
	A	B	C	D	E	F	G	H	I	J	K	L	M	N
DS-A	36	09	19	19	27	19	14	26	07	02	25	31	04	27
DS-B	19	07	21	31	05	31	31	31	50	16	21	22	02	03
DS-C	30	05	59	15	52	32	27	32	02	20	59	30	22	34
DS-D	43	51	14	10	51	60	63	32	23	51	60	56	49	51
DS-E	79	94	85	69	77	67	81	77	78	67	77	81	78	77

Desirable Traits

A. Does not try to beat the other fellow to the corner, not spectacular, does not show off.
B. Courteous, polite.
C. Not talkative, laconic, reserved, reticent.
D. Courageous, sticks to his post in danger, brave.
E. Punctual, prompt, not tardy.
F. Decides quickly, quick to react, ready to act.
G. Proficient, skillful, adept, expert.
H. Contented, satisfied, cheerful, happy.
I. Amenable to discipline, willing, adaptable, conforms to schedule, responsive to suggestion.
J. Cool, keeps his head, not excitable, deliberate, even-tempered, self-confident.
K. Alert, watchful, vigilant, keeps his eyes open.
L. Careful, does not take chances, cautious, prudent.
M. Loyal, faithful, devotion to company, can be counted on.
N. Average of all ranks.

TABLE III—SHOWING THE CORRELATION BETWEEN RANKING IN GENERAL INTELLIGENCE (AS TESTED) AND RANKING IN THE PERFORMANCE OF DUTIES

Division Superintendent	Correlation Coefficients											
	A	B	C	D	E	F	G	H	I	J	K	L
DS-A	−08	16	20	−02	19	29	16	15	03	23	−17	34
DS-B	83	03	10	27	25	19	05	01	19	14	13	17
DS-C	54	05	20	18	61	52	07	09	34	34	34	18
DS-D	77	47	58	55	13	51	54	61	66	57	57	60
DS-E	67	75	89	74	70	75	75	75	81	59	59	72

Performance of Duties

A. Fills out required reports intelligently.
B. Treats passengers courteously.
C. Uses current economically.
D. Learns his duties quickly.
E. Refrains from unnecessary conversation.
F. Reports for duty promptly. (Does not oversleep.)
G. Operates his car smoothly.
H. Uses his equipment properly and keeps it in good order.
I. Keeps to schedule.
J. Avoids accidents.
K. Keeps car under control.
L. Average of all ranks.

TABLE IV—SHOWING EXTENT TO WHICH RATINGS BY DIVISION SUPERINTENDENTS WERE INFLUENCED BY MOTORMEN'S LENGTH OF EXPERIENCE

Division Superintendent Correlation of:		DS-A	DS-B	DS-C	DS-D	DS-E
Desirable traits with length of experience	r 12	.82	.91	.70	.50	.73
Desirable traits with intelligence	r 13	.27	.03	.34	.51	.77
Length of experience, with intelligence	r 23	−.04	.04	.35	.01	.74
Desirable traits with intelligence (after eliminating influence of length of experience)	r 13.2	.53	.01	.15	.59	.50
Desirable traits with length of experience (after eliminating influence of intelligence)	r 12.3	.86	.91	.66	.58	.37

that the more intelligent a motorman is the less satisfied he will be with his job, and the sooner he will leave the service of the company. To investigate the correctness of this assumption a study was made of the relation between the intelligence standing and length of experience; the result showed practically no correlation whatever. In other words, if the twenty-four best men studied are typical of all best men, the conclusion is warranted that the more intelligent are just as likely to remain with the job as the less intelligent. If further study bears out this conclusion, one of the principal objections to hiring the brighter men will have been eliminated.

Another assumption, apparently ill-founded, has been made that the more intelligent men are less likely to be loyal to the company in times of crises. Those who oppose this assumption say, on the contrary, that the less intelligent are more readily misled by agitators, and that the more intelligent cannot be stampeded, that they think for themselves. Certainly the figures of this study (Table II, Column M) give support to those who believe the more intelligent men are more to be depended upon in times of stress.

Chief Results with Tests

To summarize the principal indications so far revealed in the use of mental tests the following points may be made:

1. No applicant should be hired who falls below 25 per cent in the intelligence tests.

2. There is a reasonably high correlation between general intelligence and the traits and duties which are important for motormen.

3. Among the best motormen there is no greater tendency for the most intelligent men to leave the service than for the less intelligent.

Report Giving Answers to Some Pertinent Questions

This report, submitted June 9, 1921, related particularly to answers to the following questions:

1. When were the so-called "poorest" men hired?

2. Do dependents increase length of service and reduce the labor turnover?

3. What causes some men to be unusually slow to learn to operate the cars?

When Were Poorest Men Hired?

Undoubtedly there are times of crisis when an employment department cannot pick and choose men, but must take what it can get, as in times of a strike or a war—times when men are scarce and when the job of motorman is not so attractive as it might otherwise be. With these points in mind, a table was made up to show when each of the twenty-three poorest men (as listed in the earlier report was hired. Study of this table shows that the first of these so-called poorest men was hired April 17, 1911, while the last one of this list was hired May 25, 1920. The figures indicate that the 1917 strike and the 1918 war drafts did apparently necessitate the employment of the poorer material, but these two crises do not explain the employment of all of this group. It also shows that of the twenty-three men considered, all but one would have been rejected under at least one of the three assumed standards already mentioned, i.e., the minimum intelligence percentage of 26, the minimum height of 67 in. and the maximum age of thirty-seven years.

The use of general intelligence tests would certainly enable the inspector of applicants to know more exactly than has been possible heretofore the caliber of the men he interviewed, even though men were scarce, and just as soon as a crisis passed he could raise the standard for applicants and thus shut out the less able men.

Dependents and Length of Service

It was pointed out in the prior report that the number of dependents possessed by a motorman bore no apparent relation to his skill and general value to the company. The research committee wished to know, however, if the number of dependents had an effect upon labor turnover, i.e., if a man with dependents was more or less prone to quit his job on account of that fact. To throw some light on this topic, several tables were prepared by the committee. These tables contain a summary of the most important facts which have a bearing on the problem and indicate that among the best motormen the more dependents a motorman has the shorter the length of time he is likely to remain in the service of the company. If a more extended study corroborated these figures it would certainly upset the preconceived ideas of many employment managers, at least so far as concerns a situation such as this one.

A possible explanation of these facts presents itself in the following line of reasoning: The best motormen are capable men and could succeed in other lines of work. When they have no dependents they can get along very well on such pay as they receive, but if they have several dependents it becomes harder to make both ends meet and they leave the service of the company for other work where there is no standard rate of pay for all men alike and where there seems to be a better avenue for economic advancement.

On the other hand the table also shows that so far as the so-called poorest men are concerned, the more dependents a man has the longer he is likely to remain in the service of the company. To explain such facts as these, the following argument may be advanced: The poorest motormen are, as a rule, relatively incompetent men and would not succeed well at most other types of work. Probably they have already learned of their own incompetence through the hard knocks of experience and are, when they have dependents, quite loath to give up this job in order to find a more lucrative one. If the men considered in these tests are a fair sampling as regards dependents and labor turnover, the inspector of applicants would be justified in showing preference to applicants without dependents, for it is only among the poorest men that dependents seem to increase the length of service, while with the best motormen the fewer the dependents, the less the turnover. At any rate, these data certainly would not warrant the inspector of applicants in giving preference to applicants with dependents.

Slow Learners

The research committee was desirous of learning why some of the motormen took longer than the customary seven-day period to "break in." Accordingly, twenty-one motormen who had taken twelve days or longer to learn the duties of motorman were interviewed and tested. From the results of the interviews and the general intelligence tests Table V was compiled and shows that if the employment department could have used the assumed standards just enumerated, only five of the twenty-one slow learners would have been hired; the other sixteen would have been rejected. If the inspector had rejected all applicants below 67 in. he would have eliminated five of the twenty-one slow learners. If all applicants older than thirty-seven years had been rejected seven of these slow learners, or one-third, would have been eliminated, and it appears that the age at "breaking in" has a really important bearing upon the facility with which a student motorman learns his duties. If the employment department could have rejected all applicants falling below the twenty-sixth intelligence percentage, twelve of these twenty-one men, or four-sevenths, would have been eliminated. It seems that men who make low scores in these tests are slow to learn the duties of motormen, and since the cost of training is an item of no little importance, it might be worth while to measure the general intelligence of all applicants considered.

TABLE V—MOTORMEN TAKING TWELVE DAYS OR MORE TO BREAK IN

Key Number of Motorman	Intelligence Percentage	Age When Hired	Height
205	61	(53)	71
101	59	24	70
216	53	37	69
218	40	37	71
204	33	37	67
217	33	(39)	(63)
219	30	32	(65)
215	29	24	69
202	27	(51)	69
104	(21)	(45)	(65)
201	(20)	(43)	67
214	(20)	37	(65)
213	(20)	32	(66)
206	(19)	29	68
211	(17)	35	69
207	(16)	27	68
208	(15)	(41)	68
210	(13)	35	67
209	(9)	(42)	67
212	(9)	33	69
203	(5)	(40)	68

Note—Parenthesized figures indicate ground for rejection under the assumed standards of Report No. 6, i.e., the minimum intelligence percentage being 26, the minimum height being 67 in., and the maximum age being thirty-seven years.

Motorman No. 203 was forty years old when he "broke in" with this company. He was about thirty-four years when he "broke in" in New York City.

Motorman No. 205 stands first in this list as regards intelligence but he was too old when he broke in, fifty-three years, hence his inaptitude at "breaking in."

No. 101 stands second in general intelligence and eventually developed into one of the best men in his division (being listed among the best in the earlier report. No reason is apparent for his slowness to "break in"; however, the use of the motor co-ordination apparatus may bring to light the real cause. The important fact in this case is that he stood relatively high in the intelligence tests and that finally he got to be a very competent motorman.

No. 216 stood third in the mental tests (43d per cent), but he was thirty-seven years old when he "broke in"; his age may have made him slow in learning. He had been a farmer and may have been unfamiliar with traffic conditions.

No. 218 was fourth in the test standings (40th per cent), but was thirty-seven years old when he "broke in."

No. 204 was thirty-seven years old when he "broke in" and had been a farmer, possibly unfamiliar with traffic conditions.

No. 217 was too old (thirty-nine years) when he "broke in" and was also too short (only 63 in.).

No. 219 was only 65 in. tall. He had been a farm hand and a sailor; in neither of these occupations did he have a good opportunity to learn traffic conditions.

No. 215 was a hardwood floor layer and had previously worked on the farm. He stood at the twenty-ninth intelligence per cent and broke in at twenty-four years. There is no apparent outstanding cause for his unusual slowness at learning his duties.

No. 202 was fifty-one years old when he "broke in." This explanation would seem sufficient to explain his slowness in learning his duties.

The other twelve slow learners are too low in general intelligence, as they range from the twenty-first per cent to the fifth per cent. Five of these twelve were also too old at the time at which they "broke in."

No. 203 was the lowest in general intelligence with a standing at the fifth per cent. The most interesting fact concerning him was that six years prior to his "breaking in" with this company he had "broken in" in New York City and had worked two years there. Only his very low standing in intelligence would explain his inability to learn his duties in operating the cars of this company in a reasonable time.

It is, of course, important to know whether the slow learners gain skill quickly enough to avoid accidents immediately after the "breaking in" period is over and whether they become within a reasonable time as competent as the men who take less time to "break in." If the slow learners do not develop average skill within reasonable time, they are certainly not to be preferred.

TABLE VI—TEST SCORES OF MOTORMAN APPLICANTS ARRANGED IN ORDER OF SIZE OF TEST SCORE

Motormen	Test Score	Motormen	Test Score
(1)	163	(15)	x 117
(2)	x 157	(16)	x 114
(3)	x 134	(17)	113
(4)	x 130	(18)	x 113
(5)	130	(19)	x 112
(6)	x 125	(20)	x 110
(7)	124	(21)	x 108
(8)	123	(22)	x 106
(9)	x 122	(23)	x 105
(10)	121	(24)	x 105
(11)	120	(25)	x 105
(12)	x 120	(26)	x 105
(13)	x 119	(27)	x 104
(14)	118	(28)	x 102
Motormen	Test Score	Motormen	Test Score
(29)	102	(43)	x 83
(30)	x 100	(44)	83
(31)	100	(45)	82
(32)	100	(46)	x 81
(33)	99	(47)	x 80
(34)	96	(48)	80
(35)	96	(49)	79
(36)	92	(50)	x 74
(37)	x 91	(51)	74
(38)	91	(52)	x 74
(39)	x 89	(53)	x 72
(40)	x 87	(54)	63
(41)	x 86	(55)	61
(42)	84	(56)	x 56

Median (Average) Score—102.

Note—All motormen marked with an (x) have left the employ of the company. It will be noted that twenty (20) motormen leaving were above the median (average) score of 102 points, while twelve (12) motormen were below the median (average) score. This indicates that, under existing conditions, the brighter motormen showed a greater tendency to leave the service.

TABLE VII—TEST SCORES OF CONDUCTOR APPLICANTS ARRANGED IN THE ORDER OF SIZE OF TEST SCORE

Conductors	Test Score	Conductors	Test Score
(1)	156	(11)	124
(2)	148	(12)	122
(3)	x 143	(13)	121
(4)	139	(14)	x 120
(5)	x 132	(15)	119
(6)	129	(16)	118
(7)	126	(17)	115
(8)	126	(18)	112
(9)	125	(19)	104
(10)	125		
Conductors	Test Score	Conductors	Test Score
(20)	x 103	(29)	88
(21)	102	(30)	x 86
(22)	100	(31)	x 86
(23)	98	(32)	83
(24)	94	(33)	x 80
(25)	92	(34)	76
(26)	92	(35)	x 70
(27)	x 89	(36)	x 69
(28)	x 88	(37)	65

Median (Average) Score—104

Note—All conductors marked with an (x) have left the service of the company. It will be noted that three (3) conductors above the median (average) score of 104 points left, while eight (8) below the median (average) score left, this indicating that the brighter conductors have a tendency to remain longer in the service than those who do not rate so high.

In comparing this table with Table VI, it will be noted that the two groups of applicants (conductors and motormen) made about the same test scores, with approximately the same average score, indicating that equally bright men are attracted to each of the two platform jobs.

Report on Intelligence Tests on New Employees

The three tables (VI, VII and VIII) on this page give the most outstanding features of the study of the platform applicants who were employed and tested in the latter half of 1921. The intelligence test used was so devised as to be practically self-explanatory. It offered no advantage to those who had had the better schooling. This test could be given by any competent employment manager with equally accurate results.

A comparison was also made of the test scores of ninety men with experience of twelve months or less. It was found that the eighteen with the greatest length of service made an average test score of 102 points. The eighteen men who stood next in length of service made an average of 106 points. The next eighteen men had an average of 104 points, the next eighteen men an average of 109½ points, while the eighteen men who stayed the shortest length of time made an average score of 100 points. Apparently, when platform men are so grouped, test scores seem to have very little, if any, relation to length of service under existing conditions.

TABLE VIII—SHOWING THE AVERAGE TEST SCORES OF PLATFORM MEN IN RELATION TO THE RATINGS GIVEN FOR GENERAL VALUE TO THE COMPANY

Ratings	Men Still in Service	Men Who Have Left Service
Motormen rated "above average"	108 plus	103 minus
Motormen rated "average"	101	113½
Motormen rated "below average"	84 minus	107 minus
Conductors rated "above average"	118 minus	132 minus
Conductors rated "average"	98 minus	80
Conductors rated "below average"	93½	83 plus

Although the number of platform men studied is too small to draw any final conclusions, it seems that there is a positive relation between test score and value to the company among those who stick to the job. However, the relation is not close.

The relationship between the test scores of those who left the service and their general value to the company is not clear, especially in the case of motormen. The ratings were given to the men by their respective division superintendents in September, 1922, which allowed, on the average, about eleven months' service with the company before the platform man was rated.

Appendix No. 2

Appendix No. 2 contains some of the detailed discussion of the report of the committee on personnel and training of transportation department employees.* It does not include a discussion of the training of one-man car operators because there are no one-man cars in San Francisco. Neither is there a discussion of standard forms for physical examination because at the present time the Market Street Railway has not assembled sufficient research data on which to offer any suggestions of value. The general criticisms of the suggested psychological tests follow:

1. One of the essential requirements for a psychological test is "standard conditions" whereby the same results would be obtained by other persons in other places. One of these "standard conditions" is a set of standard instructions so that all persons using the test will give it in the same way. It is unfortunate that the tests included in the committee report are not accompanied by instructions for their use and application. To illustrate this point, consider the fourteenth item in the first test of Appendix A, i.e., if two pencils cost 5 cents, how many may be pur-

*See *Electric Railway Journal* for Oct. 7, pages 589-592.

chased for 50 cents. This item comes in the Stanford-Binet test for fourteen-year-old children. It is supposed to be solved mentally in one minute or less. If the person tested were to use pencil and paper it would make the problem very much easier, or if a longer time were allowed to solve the problem. It is only by adhering to standard instructions that comparable results are to be obtained.

2. A test of general intelligence should be so devised that it is not a test of school training. It should give all applicants an equal chance, so far as that is possible, for general intelligence is probably innate and not acquired, and any intelligence which would give undue weight to the results of school training would, therefore, not really achieve its purpose. In Appendix B the "test to show that a man can follow instructions" (which is a phase of general intelligence) would apparently not be fair to the man of little school training. It is quite possible that an intelligent man of poor schooling might get confused by this complicated test. How many men know Independence Day is the Fourth of July?

3. It is very desirable to devise tests which can be scored objectively, i.e., the same answers will be given the same credit no matter who examines the papers. Many of the test items suggested in the report would be rejected under this criterion. An illustration of this defect occurs in the seventh item of the first test in Appendix A: "What is your idea of the value of such qualities in a conductor?" It would be very difficult to arrive at a standard method of evaluating the answers, yet we must if we are to pool or exchange results which shall be comparable.

4. The tests should be easy to score and quick to score. In the army the tests were drawn up in such a manner that stencils could be used for scoring the answers, thus rendering the work speedy, mechanical and accurate. The "common sense" test or "test of judgment" Appendix B (see last column page 591*) would satisfy this criterion, but most of the other tests would not.

5. It is desirable to employ tests which are practically self-explanatory. The employment manager is usually a busy man and he simply cannot spend a long time testing each applicant personally. It takes usually an hour or more to give the Binet tests to one person, and these tests are similar to the Binet tests in many respects. It is therefore impractical to attempt to give many of the committee report tests to the applicants.

6. A good intelligence test will be a fair measure of such so-called special abilities, such as judgment, ability to learn, ability to follow instructions and directions, memory, ability to make selective response, ability to maintain attention, ability to give a sensible account of some occurrence involving power of observation, etc. There is good evidence to believe that these special abilities are all merely phases of the one thing—general intelligence, and that a test of the latter tests the other abilities also, and if such is the case, it would seem more economical of time and effort to confine attention to testing general intelligence alone.

*References are to *Electric Railway Journal*, issue of Oct. 7.

Criticisms of Specific Portions of the Report

Appendix A. Tests for motormen: It is not at all apparent that the tests to "indicate quickness of motor reaction to special sense perception, especially sight and hearing" (foot of page 589, issue of Oct. 7*) do actually test the same mental functions that are used in the performance of motorman duties. The test "to indicate judgment of speed" (page 590*) could probably be passed by almost any one of good education regardless of his ability to judge speed while operating a car.

Appendix B. Form 1. Job Specification. (Second column, page 590*): It is an excellent plan to place before the employment manager in definite form a job specification sheet. Such a sheet would aid in focussing attention upon the requirements of the job to be filled. It tends to keep the interviewer from overlooking any of the requirements. Job specification sheets are more necessary if the employment manager must hire for many different types of jobs.

Form 4. Data Sheet. To be filled by employment agent. (Page 590-1*): This sheet makes it possible for the interviewer to record his judgment of the applicant at the time of interview. It also tends to keep the interviewer from overlooking traits, desirable or undesirable. The items on this sheet could be changed from time to time as careful study revealed some items as being important and others as unimportant.

Form 5. Data Sheet. To be sent to reference. (Page 591*): It is highly desirable to get the references of the applicant to respond with as detailed and specific information as possible. Apparently Form 5 was designed with this purpose in mind. However, it is doubtful if many of the references would reply, for the sheet requires careful study, thought and analysis.

A. I. E. E. Discusses Cars and Buses

Following a Paper on This Subject by J. C. Thirlwall, Various Speakers Consider Relative Advantages

AT A MEETING of the New York section of the American Institute of Electrical Engineers, held in New York on the evening of Sept. 20, the topic considered was the relative merits of trolley cars, trackless trolley buses and gas motor buses. There was a large audience, and J. C. Thirlwall, railway engineering department General Electric Company, was the principal speaker of the evening. Calvert Townley, chairman of the New York section, presided.

Mr. Thirlwall's Address

Mr. Thirlwall's address was largely a comparison of costs of installation and operation of car lines, trackless trolley lines, and bus lines for city service, and was accompanied by statistics which had been presented by him in a paper read in March before the engineering societies of Cincinnati and Indianapolis. These figures were published in *Bus Transportation* for September. Mr. Thirlwall said that so long as municipalities are willing to offer the use of smooth pavements free of charge to all commercial vehicles and compel the railway company to pay not only for its own tracks but for much of the paving as well, a considerable bonus is offered to users of buses. Nevertheless, except for relatively short hauls on selected routes where no attempt is made by a bus company to provide the extra equipment demanded by rush-hour traffic, a railway could show materially better financial returns on its entire investment and be much more successful in handling mass transportation than a bus line.

One reason for this is that the smallest car yet developed, the Birney safety car, will carry 50 per cent more passengers than the largest single-deck bus yet developed, so that to carry an equal number of people would require 50 per cent more buses than Birney cars. Mr. Thirlwall said he omitted in this comparison consideration of double-deck buses, like those operated on Fifth Avenue in New York and on Michigan Avenue in Chicago, because those lines are largely patronized by pleasure riders, and the double-deck bus is not suitable for business transportation. Trolley cars could also have a double deck, he said, but experience has shown that for service in this country they slowed down the schedules too much to be desirable.

The trolley bus is suitable particularly for extensions to a trolley line where the traffic is not sufficient to warrant the installation of rails, also on crosstown lines.

Mr. Thirlwall presented the accompanying table of operating expenses and fixed charges for a route 4½ miles long with street cars making the round trip, including layovers, in sixty minutes. On a fifteen-minute headway four cars would be required, on a ten-minute headway six cars, on a five-minute headway twelve cars. One reason for the high first cost of buses is that during the seven hours of heaviest riding 50 per cent more buses than cars would be required to give equal passenger capacity and carry the people. The accompanying table shows comparative figures of the three systems.

In summing up this comparison, the speaker said that for all routes extending into the business center of large or medium-sized cities the rail cars offer the most efficient and most economical form of transportation; for

suburban, feeder, and crosstown service, the trolley bus will be the most suitable vehicle, and that only special conditions that prevent the erection of an overhead line would justify the use of gasoline buses inside the city limits.

COMPARATIVE COSTS PER ROUTE-MILE OPERATED

Long Headway Twelve-Fifteen Minutes	Rail Cars	Trolley Bus	Motor Bus
Annual mileage	52,500	63,000	63,000
Total investment	$61,000	$23,800	$14,000
Fixed charges, per cent	13	13.5	16.7
Annual operating cost	$9,440	$12,500	$17,600
Annual fixed charges	7,960	3,220	2,340
Total annual cost	$17,400	$15,720	$19,940
Medium Headway, Eight-Ten Minutes			
Annual mileage	79,000	94,000	94,000
Total investment	$72,000	$33,000	$21,000
Annual operating cost	14,160	18,600	26,200
Annual fixed charges	9,360	4,450	3,500
Total annual cost	$23,520	$23,050	$29,700
Short Headway, Four-Six Minutes			
Annual mileage	157,000	188,000	188,000
Total investment	$123,500	$60,500	$42,000
Annual operating cost	28,300	37,000	52,500
Annual fixed charges	16,050	8,200	7,000
Total annual cost	$44,350	$45,200	$59,500

In conclusion Mr. Thirlwall said that the bus proponents have made many claims as to their ability to handle all of the traffic of a community, but where the buses have had an opportunity to do so in any city of considerable size, they have failed. This has been true in Bridgeport, Des Moines, Muskegon, Toledo and Saginaw. In all of these places, except Saginaw, after some weeks' trial with the bus as the only means of transportation, the community found it necessary to ask the electric railway to resume service. Even in Saginaw there is a very strong feeling, especially among the retail merchants who have experienced a loss of sales, to ask the electric railway line to begin its service again.

Discussion on Paper

At the conclusion of Mr. Thirlwall's address, Chairman Townley said that it was expected that Commissioner Grover A. Whalen of the Department of Plant and Structures, New York, would be present. He was detained but sent a statement which was read by Commissioner Mills. It is given below:

"I cannot go along with the idea that rail transportation of passengers through city streets remains the most economical method of urban conveyance. This conclusion is contrary to the indications of our experience in the Department of Plant and Structures. I say 'indicated' advisedly, for I confess I am not ready to present conclusions. We have not yet had sufficient experience either with the gasoline bus or the trackless trolley car to set forth as demonstrated the greater economy that I believe will be effected in urban transportation by the development of these two methods of surface transportation.

"As to motor buses, the department is operating none. It is supervising the operation of privately-owned buses. It has no records of costs or receipts—but we have this fact, namely: These buses are operating at a comfortable profit at a 5-cent fare on lines abandoned by trolley companies as unprofitable. This is not a carefully figured demonstration of the lower cost of transportation by gasoline buses, but it is more eloquent and more convincing than mere figures. With this experience I am pardoned, I believe, in expecting that the Department of Plant and Structures will be able to carry passengers in buses more economically than they can be carried in cars running on rails.

"I notice that the argument for transportation by rail is based largely on the allegation that 50 per cent more vehicles will be required if buses are substituted for trolley cars. This was true, but it is not true now. The motor bus has grown. The vehicle designed by this department will carry thirty-three seated passengers and twenty-seven standing—a total of sixty. Buses of this type are now in successful operation. This bus has answered the economy claim of the trolley car.

"As to the operation of trackless trolley cars, I do most positively claim that this is the most economical method of passenger transportation along public highways. When our department went into the development of this system of transportation, I had the matter of costs calculated. It developed, on information available a year ago and at costs then prevailing, that the cost per mile of service, including all costs of interest, depreciation, power, maintenance and operation, figured as follows:

Gasoline bus, per car-mile	29.55 cents
One-man trolley car, per car-mile	24.3 cents
Trackless trolley, per car-mile	20.95 cents

"Going over the calculation recently, in the light of added facts and experience, I find that the average costs figure as follows:

Gasoline bus, per car-mile	27.87 cents
One-man trolley car, per car-mile	21.60 cents
Trackless trolley, per car-mile	18.66 cents

"These figures, it is to be noted, are based on existing conditions. Moreover, they are approximate, not final. Moreover, the trolley car has reached its lowest point on the scale of cost and is not likely to go lower. The gasoline bus and the trackless car, however, are in an early stage of development, and the trend of costs in these operations will be downward as the development proceeds. I feel I am warranted, therefore, in asserting that the Department of Plant and Structures has developed in the trackless trolley system a means of passenger transportation more economical than any yet conceived. I feel that I am warranted also in believing that, if the Legislature frees us from the bonds of injunctions, the Department of Plant and Structures will be able to maintain and operate motor bus lines at smaller cost per car-mile than any cars running on tracks.

"So much for the economy phase of the problem. As for efficiency—quick and dependable service in all sorts of adverse weather conditions, the trackless trolley system and the gasoline bus system both proved themselves superior to the rail lines in our experience on Staten Island when they operated without interruption on winter days when all track lines were tied up."

Edward A. Roberts, chief of transit bureau, New York Transit Commission, followed Commissioner Mills. He quoted from a report of the Transit Commission to the effect that this body sees a place for buses in the New York transportation scheme, there being sections where service is sorely needed and where it cannot well be furnished by railways. As a suggestion to start thinking along the line of trackless trolley development Mr. Roberts asked the question: "What is the matter with the trolley bus?" This question, he said, is inspired by the fact that in spite of the length of time during which the trackless trolley has been in use on a small scale, it is used on only one line in the United States today. As a possible answer he cited the hypothetical case of a rail line faced with a demand for extended service for which the prospective business was in doubt. The natural thing would be to try out the traffic possibilities by means of a motor bus or two, adding to the number as traffic developed. The investment would thus be small and the buses would have some value if the service proved unprofitable.

Assuming, however, that business develops as expected, the time comes when a trolley bus line might be feasible. This, however, would mean the scrapping of the motor buses and making a considerable investment for overhead construction and new vehicles, or still further adding gas buses until the point is reached where a rail line would be profitable. The chances favor the additional buses in this case.

In closing Mr. Roberts said that the results of Mr. Thirlwall's work in the introduction of the safety car gave promise for the trolley bus, and he for one would hesitate to say that there is not a future for it.

Charles R. Harte, New Haven, Conn., then said that he wanted to correct a possible misapprehension as to the reason for discontinuance of street railway service in Bridgeport. This was not a breakdown of the service but the action was taken by the management as a protest against unregulated and unjustified jitney competition. Mr. Harte reminded his audience also that while only one trackless trolley line is in operation in this country, there is one in Windsor, Ont., which seems to be satisfactory, and the Toronto Transportation Commission has a number of trolley buses in use.

Prof. Morton Arendt, Columbia University, said that a feature of the trackless trolley is in the permanency of route, as compared with the gasoline bus. The presence of the overhead gives confidence of continued service and encourages real estate development.

In his closure to the discussion, Mr. Thirlwall reinforced what Professor

Arendt said. This feature is noticeable along the line on Staten Island, New York City. In a new line soon to be commissioned in Baltimore, the value of the service to the new section of the city to be served is illustrated by the backing of the undertaking financially by those whose real estate will benefit. In this case the United Railways & Electric Company will install and operate the line. As to Mr. Roberts' question Mr. Thirlwall said that many cities are considering trolley buses, but complications of one kind and another, principally over franchises, have delayed action. In a number of places the buses have been tried out on a small scale with good results. After all, the new vehicle has been available but a year or so. The city authorities in New York are desirous of extending the trolley bus service on Staten Island, and its inauguration in other places is but a question of time.

Medical Defense of Litigated Claims*

This Article Offers Some Suggestions to Consider in Medical Examinations as Well as Advice to Trial Attorneys on Connecting Direct and Cross Examinations

By John Leeming, M. D.
Medical Counsel Chicago Surface Lines

THERE are three classes of cases to be considered under this heading: First, cases of non-liability; second, cases of clear liability, and third, cases on the border line, in which the liability is in doubt. The class into which any particular case falls determines the importance of the medical defense. In the cases of clear liability there is no question in my mind but that a strong medical defense is of great assistance in enabling a jury to estimate the extent of the alleged injuries, whether the accident in question was the proximate cause and to assess the damages accordingly. In the border-line cases the medical defense is of the same importance if the defense fails to establish non-liability. In cases where the non-liability is clear it is obvious that the matter of extent of injuries is entirely irrelevant, but I have discovered that most experienced trial lawyers are loath to rely absolutely upon their ability to establish the non-liability issue for the simple reason that few cases are so clear cut. A case which appeared clearly to be a non-liability case may, after the plaintiff's evidence has been introduced, find more support for the plaintiff's theory than was anticipated, and, again, the witnesses that were relied upon by the defense to establish the non-liability may disappoint the trial attorney.

There are many surprises in the trial of lawsuits, and frequently in my experience it has occurred that an attorney who had not intended to introduce a medical defense has, when he found his case breaking badly, got in touch with me for the purpose of considering whether we could advantageously attack the plaintiff's theory that the conditions of disability were, as a medical proposition, due to the injuries.

Usually the trial attorneys with whom I have been associated have decided that in such a case it would be best to put on the medical defense with the hope of inducing the jury to render a more reasonable verdict than might otherwise be rendered. Of course, in cases of clear liability the medical defense must become the basis for defense, and in my experience there have been many cases of verdicts of not guilty where the jury, on medical evidence presented by the defense, rejected entirely the claim that the plaintiff suffered any injury whatever. Those were cases where the jury found that the alleged disability was not the result of injuries claimed to have been suffered from the accident.

My experience teaches me that when we go into court to defend a personal injury case there are two important things to be considered. The first is, who is to blame for the accident, and the second, is, how much is the individual hurt? The relative importance of these two lines of defense depends considerably upon the circumstances, and as to the first line of defense the medical adviser is of no aid. Speaking generally, I would say that if after complete investigation and a thorough conference with the crew and all available witnesses you are convinced that you can present a case to the jury of non-liability, the question of the extent of the injury is of minor importance.

While I do not advocate that a medical defense is essential in all personal injury cases, I do make the claim that in many cases it is of considerable value even in supposedly non-liability cases. It lays a valuable foundation in some cases for the argument of defendant's counsel "that this plaintiff is either mistaken or has deliberately lied in reference to the occurrence and he or she has grossly misrepresented the facts in regard to the effects of the injury." I believe that every personal injury case that goes to trial and which must be submitted to a jury should be treated as a fight and that the slogan of this association of safety first and safety always should be used in the defense of every damage suit that is brought into court. Our legal departments can be relied upon to furnish every available line of defense so far as liability is concerned, and I have the good fortune to be connected with a claim and law department that is forehanded in making thorough preparation for a possible medical defense.

Program in Medical Defense

The first step in this preparation begins immediately after the accident occurs. This consists of an effort to obtain reliable information in detail as to the character of the occurrence, the immediate conduct of the injured individual as to whether conscious or unconscious, any bleeding from eyes, ears, nose, mouth or other parts, method of leaving scene of accident, whether the journey was continued, whether the individual walked, what assistance in reaching home, etc., what medical attention was rendered and how soon, the name of the attending physician, etc., an early interview with the attending physician, preferably by a medical man to obtain a statement as to the character and extent of the injuries (in writing if possible), an effort to learn whether the attending physician is fair and friendly and an endeavor, where desirable, to arrange for a consultation and examination by a company physician. If the examination is refused, the fact is noted in the file, as to who makes the refusal, whether the patient, the patient's relatives, the attending physician or the attorney if one has already been engaged.

An early medical examination is often of great value and by using diplomacy this examination can be obtained in the majority of cases. The earlier it can be made the better, and it is highly important that it should be made by a competent medical man and arrangements made for later consultations and examinations if the case requires them.

If it is a hospital case, the same general procedure should be followed, but in addition copies should be obtained of the hospital records, including the examining room diagnosis and later the diagnosis and treatment of the attending physician, duration in the hospital and condition of the patient when discharged. Valuable information is often obtained from the hospital record as to prior condition, character of symptoms, X-ray findings, etc., which may be difficult to procure later for various reasons.

Where an examination is to be made, it becomes very important to choose the right kind of doctor for the particular examination. If it is a surgical case, do not send a gynæcologist to make the examination; if it is a gynæcologist case, do not send a specialist on internal medicine, but adapt your examiner as nearly as possible to the type of injury involved. In any case, it is important to select a medical man who will obtain a complete history—not only of the accident in question, but of previous injury and disease, the medical attendance on such prior conditions, the various medical men who have treated the patient before the date of this accident, any hospital experience ever had, a complete history of the accident in question and an accurate statement of all objective symptoms present without any effort to

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minimize or to magnify them (these objective symptoms can be testified to in court). The doctor should also obtain as fully as possible a history of the subjective symptoms in the case, noting them on a separate sheet and not in the body of his report. (These symptoms he will not be required to testify to in court because they are subjective in character and may therefore be self-serving statements.)

You will ask me, "What is the value of this list of subjective symptoms?" The answer is, they would very often indicate the type of individual you are dealing with. The very story of complaint may stamp the patient, especially if a woman, as a confirmed neurasthenic, and such knowledge is often extremely valuable, where there is a proper basis in the evidence, on the cross-examination of plaintiff's expert medical witnesses. And right here may I be permitted to offer a word of caution to our cross-examiner. If there are any lawyers present, it may be considered by them as presumptuous on my part, but at last year's meeting before this section a certain lawyer did not hesitate to speak his mind frankly and freely in condemning doctors and medical testimony generally from A to Z, so that I am sure that I will be pardoned if I offer a moderate suggestion to the members of the legal profession. My suggestion is that much damage has often been done to the defendant's case by improper cross-examination of medical witnesses. Some lawyers seem to be obsessed with the idea that to do their duty to their client it is necessary to go over every medical question that has been testified to on direct examination and make an effort to break the doctor down on cross-examination. Some lawyers do this for the purpose of showing their medical, surgical or anatomical knowledge. My observation leads me to the firm conviction that in the great majority of cases this method does more harm than good. In my lectures to law students, I give them this rule: In cross-examining an adverse medical witness, never ask him a question to which his answer can possibly hurt your case, and only ask such medical witness questions to which his answers might possibly help you, but cannot hurt you. Law students ask the question, "Can this be done?" Some of you gentlemen here may ask the same question. I answer that it can be done. Before telling you how it can be done, I will say further than it is a safe rule on disputed medical questions to prove your theory and your contention by your own medical witnesses rather than take a chance of dragging it out of an unwilling adverse witness. Take an assumed list of subjective symptoms, such for instance as your medical examiner may have obtained at the time of his examination of the patient. Let us assume that these symptoms are headache, backache, general nervousness, sleeplessness, poor appetite, very irritable, tingling sensation in the extremities, sweating of the hands and feet, twitching of the limbs, etc. The injured woman will almost invariably testify that she was perfectly well prior to the accident and never had any of these symptoms before, but that they have been continuous every since she was hurt. The attending physician will probably have testified that his patient complained of all of these symptoms ever since she was hurt. One or two expert witnesses will testify hypothetically that the accident in question was competent and sufficient to cause or bring about the symptoms described. Now how are you going to cross-examine this attending physician and how are you going to cross-examine the medical expert for the plaintiff?

MEDICAL CROSS-EXAMINATION

I will offer some general suggestions in reference to a case of this type:

Q. "Doctor, in your extensive experience as a medical man, have you ever seen a case which presented a similar group of subjective symptoms as those given to you in the hypothetical question in an individual who had never been injured?" (Yes.)

Q. "You have made a diagnosis of neurasthenia from the clinical picture presented. Have you ever encountered a similar condition in any of your patients who gave no history of injury?" (Yes.)

Q. Tell the jury what other causes than injury might be competent to produce such a condition.

Q. How about uterine displacement as a cause?

Q. Has it been your experience that an enlarged and congested uterus tipped backward and pressing against the sacrum is a sufficient cause for backache, headache and other reflex nervous phenomena?

Q. Such pelvic conditions and many others frequently occur, do they not, as a result of confinement?

(If no pelvic examination has been made.) *Q.* Do you know whether the hypothetical woman described to you was suffering from a laceration of the cervix or perineum—or a prolapse of the uterus or ovary—or whether she had any form of uterine displacement or disease?

Q. I presume you have seen a great variety of nervous phenomena resulting in women from disturbances of this character, have you not? (A yes or no will be equally valuable, for the chances are good that one or more of the jurors will be married men and will have some knowledge of how frequently such conditions cause all kinds of nervousness in women.)

Q. Are you familiar with any rectal troubles, which by continued irritation gradually develop nervousness? (Yes.)

Q. Such conditions as irritable or bleeding piles, painful fissure of the rectum, painful ulcer of the rectum, etc.?

Q. You assume, of course, as the subject was not mentioned in the hypothesis that none of these conditions existed in the hypothetical woman?

Q. Do you know whether this hypothetical woman was anaemic; it was not stated to you in the question?

Q. You will agree, will you not, that impoverished conditions of the blood is a recognized cause of nervousness?

Q. Do you know, by the way, the relative constituents of normal blood—the number, in a cubic millimeter, of red corpuscles, white corpuscles, etc.? (This, of course, not to a well qualified man.)

(If a urinalysis has been omitted in the hypothesis, a dozen questions may be asked which cannot hurt and may help you.)

Q. I suppose, doctor, many cases of nervousness are due to faulty elimination of waste products by way of the kidneys?

Q. Retention of urea and its various salts sometimes so poison the nerve centers as to produce convulsions or unconsciousness, is that true doctor?

Q. This is so well recognized in your profession that you give these conditions technical medical names, do you not?

Q. What are those technical names?

Q. Are you acquainted with the conditions known as uremic coma and uremic convulsions?

Q. Will you agree with the proposition, doctor, that in studying a case and investigating the cause of a nervous condition it is often valuable to make a careful chemical and microscopical examination of the urine?

Q. What do you mean by the term—focal infection?

Q. Are your views in harmony with the modern theory of your profession, that locked up poisonous matter in the tonsils, root cavities of the teeth, sinuses connected with the upper air passages and in many other parts of the body, is often absorbed into the system and produces very deleterious effects upon the nervous system as well as upon other body structures?

Q. Did you assume that in the hypothetical question presented to you the hypothetical person had no such focal infection in any part of her body?

Q. Did you do this, although no X-ray or other examination was made to exclude such conditions?

In some instances above, I have indicated the answer (Yes); if the witness should answer no to such questions, it would be easy to destroy his usefulness to plaintiff, because his lack of integrity and medical knowledge could be established by the defense.

The same general line of questions may safely be propounded with reference to the stomach, the liver, the intestinal tract, the heart, lungs and bronchial tubes, the special senses of sight and hearing, to say nothing of the many causes of nervousness which originate outside of the body, such as family, domestic and business troubles, the effect of hard work, long hours, sedentary habits, etc., all of which have a great bearing upon the production and continuance of nervousness.

After taking the plaintiff's medical expert—and often the attending physician too—through a line of examination like this, on the single subject of functional nervousness, you are in a position to make something of a climax in conclusion by saying:

Q. I take it, doctor, that you simply answered the hypothetical question as it was presented?

Q. You did not take anything into consideration in giving your answer that was not mentioned to you in the question?

Q. You did not have in mind, of course, any of the many other possible causes of the nervous condition?

Q. You simply assumed as the question indicated, that the accident occurred as stated, that the nervousness followed and continued as stated, and you expressed the opinion *on that hypothesis* that the accident and the nervous condition might be related as cause and effect?

Q. I suppose to be perfectly candid, doctor, you would be willing to admit that they might not be so related?

Q. Is it not a fact, doctor, that in the hypothetical question given to you, there is no cause mentioned other than injury to account for the symptoms?

This theory of asking questions of medical men on cross-examination that will elicit answers that cannot hurt you and may possibly help you can be utilized equally well in practically all cases.

Take surgical conditions like hernia, floating kidney, etc., as example; you may go as far as you like in examining for non-traumatic causes of these conditions and you are sure to get admissions that are damaging to the plaintiff's case and valuable to the defense.

Don't take the chance of trying to prove your medical theory by an adverse medical witness, especially when that witness on direct-examination has committed himself to opinions which are opposed to you, but rather as indicated by the questions I have suggested get him to admit other possible causes for the condition claimed.

Introduce evidence to back up your contention by your own medical men, and some attorneys put such witnesses on at the end of their case so that plaintiff will have but little opportunity to bring in rebuttal evidence. Ordinarily,

however, little is to be feared from any attempted rebuttal on such lines as I have indicated.

In reference to medical witnesses for the defense, if you have obtained examination of the plaintiff at any time since the accident occurred, it is a weakness in your case if you fail to call the doctor. His examination may have revealed some objective evidence of the injury, especially so if made soon after the occurrence. But a frank statement of these conditions will establish confidence with the jury and place them in a receptive frame of mind when he expresses his opinion as to duration and ultimate outcome of the injury, and if your examining physician has been properly chosen and understands his work, it will be remarkable if on the occasion of the examination he failed to discover some non-traumatic trouble or to have learned something in the past history of the plaintiff that will not be valuable to the defense.

Do not make an expert witness of your examining doctor unless he is specially qualified, but make him a fact witness as to his findings and bring out any admissions against interest which he may have obtained. Plaintiffs' attorneys have a faculty of cross-examining your examining doctor at great length and being brief with your expert witness, who is usually a better qualified man.

In presenting medical opinion evidence, endeavor to use a doctor who has specialized and has had large experience in the subject matter before the court. Do not use a neurologist for a purely surgical case and vice versa.

Drag out of him his course of study, duration of practice, hospital experience, college and teaching positions, etc. It will be received better by the jury than if he is given five or ten minutes to detail the wonderful opportunities he has had to acquire his skill and cleverness.

Use a physician who knows how to explain medical, surgical and pathological terms in common every day Main Street language and who will avoid as far as possible the use of technical and unnecessary medical terms.

Never use a medical expert who cannot control his temper. Select a man who can maintain his professional dignity with a smile and a pleasing manner regardless of the provocation.

It is important that your witness be a man who understands a hypothetical case and knows how to answer it responsively and in language that accords with legal requirements. He should avoid anything that might be construed as a desire to make a speech from the witness stand, yet he should be ready to give reasons for his answers and his opinions *if asked to do so* in a plain, simple and convincing manner and in a voice that can be heard without effort by the court and the entire jury.

It is equally important that your attorney should not confuse his assumed case with the case at bar and also to be thoroughly familiar with the correct phraseology for the termination of his hypothetical question.

Much criticism has been made of expert medical evidence. My opinion is that it is the abuse or the incorrect use of such testimony that is open to criticism. A year ago at our meeting at Atlantic City a legal representative of one of the large properties expressed his belief that this form of testimony was of no value whatever; that no one on the jury would believe it and that it would be much better to use the money expended in this way to pay judgments. By his methods and with the materials he used, his opinion may possibly have been correct, though in this jurisdiction, as I have indicated, the use of medical evidence has proved to be of value.

Importance of Publicity

West Virginia Utility Men, Meeting at Charleston, Plan to Promote It

AT THE annual convention of the Public Utilities Association of West Virginia, held at Charleston on Oct. 20 and 21, plans were made for a publicity campaign in the state to educate the public concerning the utilities. M. H. Aylesworth, executive manager of the National Electric Light Association, told of the advertising campaign launched by the body he represents.

Former Governor W. A. MacCorkle was toastmaster at a dinner given the delegates at the Kanawha Hotel, at which Mr. Aylesworth declared that within the next ten years public utilities will sell their securities over the counter in scrip form. He contrasted customer ownership of public utility stocks with political ownership and showed to what an enormous extent the people by direct ownership and through ownership by life insurance and other mutual companies were interested in the welfare of public utilities. Dozier A. Devane of Washington, D. C., a former member of the Florida Railroad Commission, supported Mr. Aylesworth's views and advocated that employees "sell" their companies to the users of public service.

W. H. Hallanan, State Tax Commissioner, said that next to the banks the public utilities are taxed closer to the legal mark than any other taxpayers in the state. He depreciated the idea of municipal ownership, as it withdrew taxable assets from the tax lists.

Governor Morgan asserted that he knew of some public utilities that were taxed higher than their properties would sell for on the open market. Speaking from his four and one-half years' experience on the Public Service Commission, he urged that all public utilities continue to give improved service and when increases are needed ask for only as much as is their just due. He condemned municipal ownership and said paternalism and bolshevism, which he described as socialism in action, were the two arch enemies of government.

The association elected C. P. Billings of the Wheeling Traction Company president. Vice-presidents chosen were C. H. Brues of Wheeling, Mentor Hetzor of Moundsville and W. R. Power of Huntington. A. M. Hill was re-elected treasurer and A. Bliss McCrum, secretary.

Express Rates Before State Commissioners

AT THE suggestion of the Interstate Commerce Commission, the subject of express rates, which has been instituted for investigation by the Commission, known as Docket 13930, and set for hearing in Washington on Nov. 20, will be added to the program at the convention of the National Association of Railway & Utility Commissioners to be held at Detroit beginning Nov. 4. Chairman McChord of the commission suggests that this express case would be a particularly apt one in which to apply in full the co-operative plan between the Interstate Commerce Commission and the state commissions with respect to both classes of rates, intrastate and interstate. Chairman McChord will be in attendance at this convention. The program for the meeting at Detroit was referred to in the *Electric Railway Journal* for Oct. 21.

Power and Mechanical Engineering Exposition to Be Held

A NATIONAL exposition of power and mechanical engineering will be held for one week beginning Thursday, Dec. 7, 1922, in Grand Central Palace, New York City. This will come at the close of the meeting of the American Society of Mechanical Engineers and the American Society of Refrigerating Engineers. There will be displayed steam turbines, steam engines, steam boilers, feed-water heaters, superheaters, economizers, metering devices, stokers, coal-handling apparatus, valves and pipe fittings, etc. The advisory committee of the exposition includes men prominent in the national engineering societies, among them being M. R. Bump, of the Doherty Organization; E. B. Katté, chief engineer of electric traction, New York Central Railroad; F. R. Low, editor of *Power*; D. S. Kimball, president American Society of Mechanical Engineers, and others.

Education for Highway Engineering and Transport

THERE will be held in Washington, D. C., from Oct. 26 to 28, the Second National Conference on Education for Highway Engineering and Highway Transport under the auspices of the Highway Education Board. The chairman of this board is John J. Tigert, United States Commissioner of Education. The board also comprises the chief of the Bureau of Public Roads, a colonel of the Corps of Engineers, U. S. Army, and representatives of the National Automobile Chamber of Commerce, the Society for the Promotion of Engineering Education, the Rubber Association of America and the Society of Automotive Engineers. The papers and discussions will have to do not only with educational matters, but also with the general aspects of the subject.

News of the Electric Railways

FINANCIAL AND CORPORATE :: TRAFFIC AND TRANSPORTATION
PERSONAL MENTION

Jitney Elimination Question

Buffalo Situation Clears Up as 375 Jitneys Are Ordered to Stop After Injunction

The strike of platform employees on the local and interurban lines of the International Railway, Buffalo, which is entering its fifth month, is a dead issue and the situation has now resolved itself into a fight on the part of the railway to rid the streets of jitneys, which continue to operate in defiance of the law and court injunctions.

International Opposed to Mr. Hoadley

Joseph H. Hoadley, New York, president of the Manhattan Transit Company, and H. D. Chapin, New York, a representative of the company, are under arrest on warrants charging conspiracy to violate the transportation corporation law. The International Railway is the complainant. Members of the Buffalo Jitney Owners' Association are alleged to have leased their cars to the Manhattan Transit Company, which claims authority to operate vehicles for a 10-cent fare.

For the privilege of operating a jitney as a unit of the fleet of the Manhattan Transit Company in Buffalo, each driver or owner agrees to pay $50 in five installments of $10 each and $1 a day, besides contributing to the cost of supervision, inspection and regulation, which would be close to 75 cents a day.

Another clause in the lease gives the Manhattan company exclusive right for advertising space and privileges in each jitney. It is the contention of the International Railway that the Manhattan company would receive more than $155,000 from Buffalo jitney owners on this basis without any overhead expense. Officers of the Jitney Owners' Association would receive more than $102,000 for supervision, inspection and regulation expenses.

Injunction Is Issued

Justice George E. Pierce in Supreme Court has issued an injunction restraining the Manhattan Transit Company from operating buses in the streets of Buffalo. Application for the injunction was made by Henry W. Killeen of Penney, Killeen & Nye, attorneys for the International. After the arrest of President Hoadley and the issuance of the injunction order, the Manhattan Transit Company called off the operation of 375 jitneys which have been operating in Buffalo under licenses issued by the New York company through Mr. Hoadley.

Even the operation of 16-cent jitneys in Buffalo is illegal, Justice Harry L. Taylor has ruled in Supreme Court. It was the contention of the jitney owners that by charging 16 cents they would not have to secure a certificate of convenience and necessity from the Public Service Commission because that applies only to vehicles operating through the streets at a rate of fare of 15 cents or less. The court has also ruled that automobiles run for hire cannot operate over a fixed route paralleling the lines of the traction company.

The Appellate Division, Fourth Department, Supreme Court at Rochester, has reversed Justice Charles Pooley in Supreme Court at Buffalo, who, on Aug. 7, granted a peremptory writ of mandamus to the International Railway, directing Mayor Frank X. Schawb to enforce certain provisions of the transportation and highways law. Presiding Justice Frederick W. Krause in his prevailing opinion reviews the history of the Buffalo street car strike and says that it is his opinion that the issuance of the writ of mandamus was an unwarranted interference in details of executive power and that, in the exercise of the judicial discretion, the application should have been denied.

In touching upon the legality of jitney operation in Buffalo, Justice Krause says:

> I think it clearly appears that many of these vehicles were operated in violation of law and such violation has been held to be misdemeanor under Sec. 29 of the Penal Law, but the mere fact that an automobile driver or owner permits others to ride in his vehicle is not unlawful jitney service.

Conferences on Service at Cost Under Way

The first of a series of conferences were held early in the week between representatives of the city and three representatives of the International with the view of working out a service-at-cost plan for the local lines of the traction company. The meeting was secret. While the conference was being held, delegates of the Amalgamated Association of Street & Electric Railway Employees from all parts of the United States and Canada were holding a secret session in McLeod's Hotel to discuss ways and means for the support of Buffalo strikers and their families during the winter months.

Mayor Ernest B. Crosby of Lockport, by authority of action taken at a public hearing a week ago, has sent to the Lockport Common Council his appointment of a committee of five citizens to consider the purchase and operation of the local lines of the International in Lockport. There has been no local service in Lockport since the strike was called, July 1. The city is without authority to purchase and operate traction lines, but it is declared that a bill will be introduced into the State Legislature this winter to enable the city to acquire the property.

Mayor's Plan Ridiculed

Head of New York Commission Characterizes Hylan's Billion Dollar Proposal as Impossible

The plan of Mayor Hylan of New York for new transit construction has been characterized as "impossible" by George McAneny, chairman of the Transit Commission. In a detailed statement attacking the Hylan plan and the Mayor's refusal to co-operate for the building of needed subway lines, Mr. McAneny has supported his description of the Mayor's plan as chimerical with the following reasons:

1. Because the Mayor predicates his new lines on the basis of municipal operation, which, according to Mr. McAneny, is entirely dependent upon the policy of Hylan's successors. Furthermore, the transit chairman maintains that such a basis of operation will not be feasible for many years.
2. Because the city cannot finance the Hylan plan of new construction, which, Mr. McAneny declares, would require an expenditure of $1,063,000,000 rather than the $600,000,000 estimated by the members of the Board of Estimate. The city would have to spend $500,000,000 to carry out the first five years' work contemplated in the Mayor's program, according to Mr. McAneny.
3. Because the Mayor's insistence upon municipal operation for the lines to be built would, according to Mr. McAneny, mean that they would not become an integral part of the present system. The result, the transit chairman asserts, would be a piecemeal system over which a single 5-cent fare would be a physical impossibility.

Mr. McAneny declared that the promises the Mayor has been making to communities all over the city that such lines will be built merely because he now puts them on a paper map are not only empty promises but part of a plan of deception that the people themselves should resent.

Asserting that the Hylan Administration has delayed and obstructed and blockaded every attempt to solve the problem of increased facilities, Mr. McAneny says it was "inconceivable that the people of the city will themselves brook any further delays when the situation is better understood."

Mr. McAneny gave the following itemized analysis of the cost of the Hylan plan as estimated by the Transit Commission's engineering and accounting experts:

To buy out the interests of the Interborough and B. R. T. companies in those parts of the existing lines that he proposes should be taken would cost	$164,000,000
To pay for the exchange of the Broadway-Bronx extensions, that is, the West Side line of the Interborough Company, for the Lexington Avenue, or East Side line, which he proposes the company shall retain, would cost, on the basis of present operating values	24,000,000
To build and equip the new subways for which his scheme provides would cost	875,900,000
The total of these three items alone is	$1,063,900,000

Mr. McAneny said that with the addition of the building of his tri-borough

bridge connecting Manhattan, Queens, and The Bronx, at an expenditure of $25,000,000 and upward, bus equipment, etc., the plan the Mayor has put forward would cost pretty nearly double the sum the Mayor claims for it. The details of the commission's program have been outlined previously.

Future Form of Transportation for Pasadena Before City Directors

The City Directors of Pasadena, Cal., who have been studying its future transportation problem for the past eight months, have now before them many different solutions offered from various sources, and yet have reached no decision. They have been studying transportation in executive sessions for the most part. They have visited Long Beach to inspect transportation affairs in that city and with particular reference to the bus system operated.

On Oct. 4 the Pacific Electric Railway applied for a forty-year franchise extension, and the City Directors in turn denied the application without comment. On the same day that the application was presented the directors also heard from a recently organized transportation body known as the People's League and from the jitney owners, both opposed to the railway. The jitney owners sent notice to the directors through their organization at the same time that it was preparing petitions for a traction initiative at the November election, which would require the directors to grant five-year permits for bus operation.

The new Pacific Electric proposal, except for the forty-year franchise, is virtually the same as previous proposals, whereby the company in seeking renewals of some of its franchises now about to expire agreed to make an expenditure of approximately $800,000 in improvements to its local lines, as well as extensions, in Pasadena.

The railway requests a double-track franchise on Los Robles Avenue from California to Washington street, a franchise to extend a single-track line on North Los Angeles Avenue from Washington Street to Woodbury Road, and the renewal of its double-track franchise on East Colorado Street from Hill to Lake Avenues.

The Merchants' Association of Pasadena has urged that the Pacific Electric proposal, which follows the lines of an engineer's report made to the directors of the city, be submitted to the vote of the people. The Federated Improvement Association is campaigning to the effect that it wants both the Pacific Electric and the bus proposals submitted to the people, and the other proposition is in the form of an initiative petition in circulation to require the city to accept the bus proposition. Municipally owned buses have been recommended from several sources. The problem is complicated for the City Directors due to the fact that the jitney owners appear to be able to get referendum signatures enough to hold up any transportation policy that may be adopted. One ordinance regulating jitneys in the city of Pasadena has already been defeated in this manner.

Double Trolley to Go

District of Columbia Commission So Decided Following Investigation and Hearing

Authority to abolish the double trolley system has been granted the traction companies of Washington by the District of Columbia Public Utilities Commission following an investigation by the commission and a public hearing at which no opposition developed.

For many years four lines in Washington have been operated by double trolleys, three by the Washington Railway & Electric Company and subsidiaries and one by the Capitol Traction Company. One line using the former's tracks has been in the peculiar position of having been operated by three systems, single and double trolley and underground slot.

Investigation by engineers of the Public Utilities Commission disclosed the fact that the detention factor was considerably higher on lines with the double trolley system than on those with single trolley, grounded return system, due to more frequent breakage, increased danger of crossing and other elements.

Evidence at the hearing showed that the possibility of the electrolysis of underground structures with a single trolley, grounded return system, if properly designated, constructed and maintained, "is extremely remote." It was this claim of danger of electrolysis which originated the demand for the double trolley system and kept it in effect for many years on the older lines of the District of Columbia. The evidence also showed that the double overhead trolley system presents operating difficulties which result in inconvenience and possible danger to the public as well as considerable added expense to the companies.

The commission directed that the companies, in making replacements by installing the single trolley system, fulfill these requirements:

> Each rail joint shall be bonded with an electrically welded, unconcealed bond; the rails of each track shall be cross-bonded at intervals of not more than 500 ft.; double tracks shall be completely cross-bonded at intervals of not more than 1,000 ft.; jumper bonds shall be installed around each piece of special work; each such bond, cross-bond or jumper-bond shall be equivalent to No. 0000 copper wire and shall at all times be maintained in good condition and in thorough contact with the rails.

Previous to this hearing, the companies had tried several times but without success to have the change brought about.

The order, when carried into effect, will leave two systems of power-feed in effect for the street cars of Washington, the single overhead trolley and the underground slot. All lines in the business district use the underground slot, and some have this system their full length. In the outskirts of the city the majority of the lines use the overhead trolley.

Obtains Permanent Injunction Against Striking Employees

The temporary injunction issued out of United States District Judge Bledsoe's court in Los Angeles in July, 1918, restraining members of the locomotive engineers' and trainmen's unions from interfering with the operations of the Pacific Electric Railway lines, which was due to a strike being called by the trainmen, was made permanent by a decision rendered several weeks ago by United States District Judge Frank H. Rudkin of Spokane, Wash.

Judge Rudkin heard the case in Los Angeles in March, 1922, which was fully reviewed in the *Electric Railway Journal*, issue of March 18, 1922, and the Judge has had the case under consideration ever since. The suit was brought by the Pacific Electric Railway against M. E. Montgomery and other officials of the railway unions, and it was upon this that the action of Judge Bledsoe was based when he issued the restraining order against the unions temporarily in July, 1918. Some time ago a motion was filed by the unions for the dissolution of the injunction obtained four years ago, it being the declaration of the unions that all excuse for the action of the court had now passed. However, the position of the unions was combated by the railway and much testimony was taken by both sides at the time of the trial held in March, 1922.

The present suit was brought against certain union leaders and unions and the general object of the case was to obtain an injunction restraining the defendants from interfering with the contractual relations existing between the plaintiff and its employees.

This temporary injunction was allowed and later on approved by a higher court on appeal.

Toledo Considers Use of Pass

After a consultation with Walter Jackson in Toledo during the week ended Oct. 21 Street Railway Commissioner Wilfred E. Cann declared that he was favorably impressed with the weekly pass. He said the question of adopting the pass for use in Toledo would depend largely on Mr. Jackson's analysis of traffic data which he took with him when he left for his home. Mr. Cann has asked Mr. Jackson to submit his findings in the nature of answers to several definite questions. Mr. Cann said:

> If we could sell 14,000 passes a week we could obtain the equivalent of the present total revenue of the lines.
>
> Riders usually use the pass from 3.2 to 4.5 times a day according to averages we have been able to obtain.

Commissioner Cann told a group of business men that rejection of the one-man cars would not deter him from his efforts to improve service and that he would probably urge the use of trackless trolleys for some extensions next summer.

The Council would probably have to give special permission for a trial of the weekly pass. Mr. Cann has not said what the price of the pass would probably be.

Favorable Comment on Plea for Relief from Paving Charges

Both the Oshkosh *Northwestern* and the Kenosha *News* have commented in their editorial columns recently on the declaration made by Carl D. Jackson, chairman of the Wisconsin Railroad Commission and president of the National Association of Public Utility Commissioners, that the present law which requires electric railways to pay for pavements between their tracks is all wrong and should be repealed.

Mr. Jackson explained that the plan originated when horse-drawn street cars were in vogue, and it was based on the idea that the horses wore out the pavements, wherefore their owners, the street car companies, should stand the cost of pavement construction and replacement. The old horse cars, however, no longer are used, so that in view of this changed condition, justice calls for the abandonment of the present plan of assessing costs of paving improvements where street car tracks are concerned. Mr. Jackson then went on to explain how the paving costs assessed against the railways are passed on to the consumer.

All the points made by Mr. Jackson have been made before from time to time, but it is seldom that the newspapers have reacted so favorably to them. Thus the *Northwestern* said:

> There seems to be much merit in the line of argument advanced for a change in the present method of assessing costs for pavements between street car tracks. It is a real injustice, moreover, to penalize the street car riders in this manner, and it obviously is opposed to public welfare to make street car service cost more than it should, which is the actual result of the present policy. And now that attention has been called to this question, it is the duty of the public representatives to give it careful consideration and to revise the law, if as claimed, the law is working to the detriment of general public interests.

The *News* said in part:

> Mr. Jackson is offering a decidedly meritorious line of argument when he suggests that the railway companies should be asked to sell transportation and nothing else. His reasoning is excellent and the people are going to come to see it in the very near future. Street railway companies are not going to operate unless there is a chance for them to earn profit or an indication that they will develop such an earning chance. Added burdens must be eliminated if the street cars are to be kept going and the fare kept at a rate which the people can afford to pay and be willing to pay.

Application of Staley System Before the I.C.C.

An application has been made to the Interstate Commerce Commission by W. L. Staley, the president of the Staley System of Electrified Railways, for the requisite authority to retain the excess earnings as allowed newly constructed lines. In this petition Mr. Staley sets forth that he plans to construct an electrified railroad with 950 miles of main line and 225 miles of branch lines to serve points between the southwestern border of Colorado and a point on the Gulf of California.

The petition sets forth that the principal purpose of the line is to transport coal and coke from the Gallut-Durango fields of Colorado to the mining and metallurgical industries of southern Arizona. The proposed line intends to serve the following places: Durango and Cortez in Colorado; Luna, Grants, Bluewater, Farmington and Aztec in New Mexico; Tucson, Casagrande, Phoenix, Florence, Winkleman, Safford, Solomanville, Clifton, Morenci and Metcalf, in Arizona.

The petition points out that the country to be traversed is rich in mineral, forest and agricultural resources. The line is intended to furnish an outlet for their products to tidewater.

An outline of the plans of the Staley system for building the new lines was published in the *Electric Railway Journal* for Sept. 2, page 334.

Inquiry Into Bus Operation Proves Lively

The New York Transit Commission has taken up recently as part of its inquiry into traction affairs the subject of bus operation in New York City as fostered by the city itself. Most of the present services of this kind were started as emergency routes to afford means of communication following the suspension of surface line car operation. Many of the buses are run by individuals and service has been proved by the commission to be totally unreliable so far as schedules are concerned and wholly inadequate to meet traffic demands. The degree of overcrowding at certain points has reached very high proportions, proportions higher even than are on record on any of the transit lines even at the hours of traffic saturation.

Buses have been leased to individual operators, and on account of their lack of financial responsibility a total of more than $1,000,000 in potential damage claims has piled up against the city. Moreover, the whole operation of the buses appears to be hedged about with politics. In this connection individual operators have told on the stand of payment said to have been demanded of them to secure preferment in the matter of the assignment of routes and it has been brought out that Mayor Hylan's son-in-law's brother is in the business of furnishing insurance to drivers of the bus lines. An Alderman is also in the business of insuring buses. Counsel Shearn of the commission said that he always wondered about the interest displayed by Mayor Hylan in his own $25,000,000 bus proposition, but that "after looking into this business a little bit I can understand it better, for the testimony indicates what choice pickings there would be in it for the politicians."

Bill in Prospect for Control of Utilities in British Columbia

The Federal Government has removed the British Columbia Electric Railway, Vancouver, B. C., from the control of the Board of Railway Commissioners. The Union of British Columbia Municipalities has long been protesting against the policy of federal control of a corporation operating thousands of miles from Ottawa, the government seat.

At a recent convention the British Columbia municipalities went on record as favoring the appointment of a provincial public utilities commission and a bill is now being prepared which will provide for the control of public utility corporations within the province of British Columbia.

The details of the plan which will be submitted to the Legislature next month have been outlined by A. M. Manson, Attorney-General. According to the bill a permanent commission will not be formed.

In disputes relative to rates and service, the government will be empowered to appoint a commission or sole commissioner under the public inquiries act to deal with the controversy and render a decision. The government will grant such an inquiry upon application in writing from the municipal council affected or from 100 or more provincial voters residing in a district affected, but without municipal organization, or from the company.

The commission will have complete jurisdiction over fares for passenger service. The bill provides that, in considering rates, the commission is to "have due regard to giving the company a fair and reasonable return upon the appraised value of the property of the company and to the protection of the public from rates that are excessive."

Extensive Bus System Planned for Chicago

Plans calling for 70 miles of bus route on the south side of Chicago, Ill., 40 miles on the west side and 30 miles on the north side, and greatly increased service on existing routes of the Chicago Motor Bus Company have been announced by financial interests which recently gained control of the Lake Shore Motor Bus Company. This is the holding company for the Chicago Motor Bus Company, the operating company, and the American Motor Bus Company, which is the manufacturing company. Financial control has been secured by John A. Hertz, president of the Yellow Cab Company; Charles MacCulloch, president of the Parmelee Transfer Company and vice-president of the Yellow Cab Manufacturing Company; W. H. Wrigley, Jr., and other Chicagoans with extensive financial connections. John A. Ritchie, formerly president of the Fifth Avenue Coach Company of New York City, has been elected president, general manager and a director of the company. G. A. Green, formerly of the Fifth Avenue Coach Company, has also joined the Chicago company.

The buses to be operated will be of a design combining features of the L type coach of the Fifth Avenue company with the latest open-top double-deck model of the Chicago Motor Bus Company. They are to seat sixty-eight persons. The company expects to spend $3,500,000 in building a bus system.

Trunk routes will operate into the Loop district. The fare is to be 10 cents.

Financial and Corporate

Reorganization Slow Work

Difficulties Encountered in Putting Through Pittsburgh Plan Are Expected to Be Removed

Nothing definite of an official nature has been made public now for some time about the development of the plans for the reorganization of the Pittsburgh (Pa.) Railways. In consequence it might be supposed that the work of completing the plan has been allowed to drag, but that is not the fact.

The interests charged with the responsibility for arranging to carry the matter through have been diligently at work, and have made considerable progress in working out the details. They have, however, encountered several stumbling blocks to further progress. These would seem to make it impossible to comply with the time limit fixed by the Public Service Commission within which to meet certain conditions, but the difficulties encountered are not regarded at this time as presenting barriers insurmountable.

To be as specific as the information available will permit, questions have come up for settlement in connection with the raising of $5,000,000 of new money for use in providing improvements, in connection with the exchange of some of the underlying securities for securities in the new company, and also in connection with acceptance of the new plan by some of the municipalities. The interest rate and length of the term of the new loan are said to be the stickers on that issue.

With respect to the underlying liens, it is understood that some holders are insisting upon a direct guarantee of principal and interest from the Philadelphia Company as a condition of their assenting to the new plan. This was not contemplated under the terms of the preliminary reorganization plan, and the Philadelphia Company, which controls the Pittsburgh Railways Company, is understood to be standing out for the acceptance of the plan of all holders without any preference to them except such as naturally adheres under present priority rights of the holders as fixed by the existing liens on the physical property or on earning power.

As for the municipalities, more than 125 in Allegheny and Washington Counties are entered by the railway and not more than twenty-five, including Pittsburgh, are reported to have accepted the reorganization ordinance. This, however, is regarded as the least troublesome of the problems encountered.

It will be recalled that the railway was to have been reorganized with a capital of $62,500,000, the valuation placed upon the property in the spring of 1920 by the State Public Service Commission. A traction conference board was to have been created, to supervise an annual budget of the proposed new company, and to which Pittsburgh and other municipalities, the latter combined, would elect members.

It was first proposed, when former Mayor E. V. Babcock and the City Council approved the plan a year ago, that the reorganization should be started last March 1. Then it was made June 1, which date the State Public Service Commission fixed. A postponement was obtained by the Philadelphia Company to Nov. 1.

As indicated previously it is confidently believed that all the difficulties which have so far presented themselves will be ironed out satisfactorily, but the need may arise for modifying the reorganization plan slightly. With this in mind a meeting was held a few days ago at which Mayor William A. Magee, members of the City Council and Arthur W. Thompson, president of the Philadelphia Company, and the legal advisers of the company and the city all conferred. The outcome of the deliberations was not announced beyond a statement indicating that the plan might have to be modified slightly, but that the reorganization would undoubtedly go through with its main terms unaltered.

The principal provisions of the terms of the ordinance under which the reorganization is to be carried out were reviewed in the *Electric Railway Journal* for Nov. 21, 1921, page 967.

Seattle Municipal Road Reports Profit

The Seattle Municipal Railway operated with a margin of $39,001 over all actual expenditures during the month of August, according to figures compiled by D. W. Henderson, general superintendent of the line. The gross revenues were $535,469, and the total expenditures were $496,457 including $70,250 set aside for redemption of bonds, $20,000 for depreciation and $69,287 for interest. This does not take into consideration $57,092 charged to depreciation, only $20,000 of which actually is set aside for that purpose by the City Council. The operating expenses were $394,012. Figures show that all railway lines now are taking in more revenue per car mile than it is costing to run them per car mile. The four bus lines, however, are costing more per car mile than the revenue on the same basis.

Will Redeem Bonds.—The Southern Colorado Power Company, Pueblo, Colo., formerly the Arkansas Valley Railway, Light & Power Company, will redeem on Nov. 1, 1922, all the $4,475,300 outstanding first and refunding mortgage sinking fund bonds of the old Arkansas company.

Successor Company Formed

General Gas & Electric Corporation Acquires Assets of General Gas & Electric Company

As of Sept. 15, 1922, the General Gas & Electric Company sold all of its assets to General Gas & Electric Corporation. In payment therefor the latter corporation issued to the General Gas & Electric Company the following stock of General Gas & Electric Corporation:

12,500	shares of cumulative preferred stock, Class A
12,500	shares of cumulative preferred stock, Class B
40,259	shares of convertible preferred stock
45,154	shares of common stock

and assumes all liabilities of the General Gas & Electric Company.

The new corporation is a Maine corporation with an authorized capital stock of 450,000 shares, without nominal or par value, subdivided into:

130,000	shares of cumulative preferred stock, Class A
70,000	shares of cumulative preferred stock, Class B
100,000	shares of convertible preferred stock
150,000	shares of common stock

On Oct. 2 a dividend of $2 a share on General Gas & Electric Corporation cumulative preferred stock, Class A, was declared, being at the rate of $8 per share per annum for the quarter ended Sept. 30, 1922.

The cumulative preferred stock of the General Gas & Electric Company is exchangeable for cumulative preferred stock, Class A, and cumulative preferred stock, Class B, of General Gas & Electric Corporation, on a basis of half a share of Class A stock and half a share of Class B stock for each full share of cumulative preferred stock of the General Gas & Electric Company.

The Guaranty Trust Company, New York, has been appointed depository for the purpose of effecting this exchange, and in addition to the Class A and Class B cumulative preferred stock of General Gas & Electric Corporation, the holders of the General Gas & Electric Company's cumulative preferred stock will receive at the time of exchange their proportion of the dividend declared on the cumulative preferred stock, Class A, of General Gas & Electric Corporation.

In connection with the acquisition by General Gas & Electric Corporation of all the assets of the General Gas & Electric Company and the assumption of all the liabilities, General Gas & Electric Corporation has arranged to issue $2,060,100 principal amount of 7 per cent, sinking fund gold bonds, Series A, in exchange for a like principal amount of outstanding 6 per cent ten-year secured gold bonds of the General Gas & Electric Company. This represents 50 per cent of the 6 per cent ten-year secured gold bonds outstanding as of Sept. 15, 1922.

The 7 per cent sinking fund gold bonds, Series A, of General Gas & Electric Corporation are dated Sept. 1, 1922, mature Sept. 1, 1952, bear 7 per cent interest payable semi-annually on March 1 and Sept. 1, and have as col-

lateral security the 6 per cent ten-year secured gold bonds of the General Gas & Electric Company surrendered for exchange. The trust agreement securing the General Gas & Electric Corporation bonds provides for a graduated sinking fund which will retire all the bonds prior to maturity.

The General Gas & Electric Company controlled the Reading Transit & Light Company, Rutland Railway, Light & Power Company, and Northwestern Ohio Railway & Power Company.

Practically All East St. Louis Stockholders Accept Terms

The offer of the North American Company, New York, N. Y., to purchase the stock of the East St. Louis & Suburban Railway has been accepted by 98 per cent of the preferred and 95 per cent of the common shareholders, who have deposited their stock for transfer under the terms offered. Time fixed for deposit was Oct. 16, but a short extension has been granted to enable those who have not yet deposited their stock to do so. The management is offering the few outstanding stockholders who prefer to sell their stock outright to accepting the original terms of the offer, market prices of $50 a share for their preferred and $9 a share for their common stock. The original offer was at the rate of $55 for the preferred and $10 for the common, payable one-half in North American preferred at $50 a share and one-half in common at $100 a share.

Sioux City Property Changes

The Sioux City Gas & Electric Company, Sioux City, Ia., a majority of whose outstanding stock is owned by United Gas Improvement Company, Philadelphia, Pa., is acquiring the electric generating plant and distribution system of Sioux City Service Company, thus placing the entire electric light and power and gas business in Sioux City under its ownership. It will also own most of the outstanding stock of the Service company, which will continue to operate the city's street railway and heating business. The present financing provides funds to retire at par the $2,051,000 outstanding first 5s of the Service company. Upon completion of this financing there will be outstanding $1,779,300 of 7 per cent preferred stock, $4,000,000 of common and $4,500,000 in first mortgage 6s.

Reorganization Plan in Prospect

In the belief that the Missouri Public Service Commission will allow a valuation of not less than $65,000,000 on the United Railways of St. Louis, the protective committee of preferred stockholders has issued a call for the holders of this stock to deposit their shares with the committee on or before Nov. 15. F. O. Watts, president of the First National Bank of St. Louis, is chairman of the committee. The total preferred stock outstanding has a par value of $16,383,000.

Walter W. Smith, vice-president of the First National Bank of St. Louis, secretary of the committee, says a hypothetical re-organization plan might be worked out on a predicated valuation of $65,000,000, and permission for the company to earn 7 per cent on that amount, somewhat as follows: Six per cent bonds to the amount of $48,000,000 would be issued in place of the existing total of $54,890,000 of funded debt and receiver's certificates. The new issue would be used to take up the receiver's certificates and pay off the underlying bonds. The remainder would be exchanged for other issues. The holders of the present securities, which bear interest at 4 and 5 per cent, would receive less in par value, but approximately an equal income since the new securities would bear 6 per cent.

On a valuation of $65,000,000, the 7 per cent return would bring in $4,550,000, of which $2,880,000 would go for interest charges. There would remain $1,670,000 in income on an equity of $17,000,000 for the preferred and common shares.

The statement issued by the protective committee said that the time had now arrived when the holders must either deposit their stock or forego the benefits which would accrue to the large number of stockholders whom the committee represented.

Financial News Notes

Service Resumption in Brooklyn.—Through the co-operation of the New York Transit Commission, Federal Judge Julius M. Mayer and Lindley M. Garrison, receiver of the Brooklyn Rapid Transit, service is to be resumed on the Park Avenue line in Brooklyn, and also a part of the Marcy Avenue route. The lines have not been run since the strike of 1920.

Receivership Case Again Postponed.—Federal Judge Mayer at New York announced on Oct. 24 that the application of the Continental Securities Company for the appointment of a receiver for the Interborough Rapid Transit Company, New York, because of a threatened default in payment of interest has been adjourned until Nov. 24, to allow the reorganization committee time to complete its work.

Expert Retained to Appraise Akron Property.—Albert S. Richey has been employed by the city of Akron, Ohio, to make an appraisal of the railway property of the Northern Ohio Traction & Light Company within the city limits of Akron. It is understood that this appraisal is to be used in the negotiations between the city and the company for a new franchise to replace the one which expires in 1924.

New Orleans Issue Offered.—An issue of $12,000,000 first and refunding mortgage 5 per cent bonds, Series A, of the New Orleans Public Service, Inc., is offered by Dillon, Read & Company, New York at 90 and interest, to yield about 5.70 per cent. The corporation has been organized to acquire the entire New Orleans Railway & Light Company under reorganization. The bonds are redeemable as a whole or in part at 105 on or before Oct. 1, 1927, at 104 and interest in the next five years, at 103 in the next five, at 102 in the next five, at 101 in the next five and 100½ prior to maturity, Oct. 1, 1952.

	Latest	Month Ago	Year Ago	Peak	1913
Street Railway Fares*	Oct. 1922 **7.00**	Sept. 1922 **7.01**	Oct. 1921 **7.24**	May 1921 **7.24**	**4.84**
Street Railway Materials*	Sept. 1922 **181**	Aug. 1922 **189**	Sept. 1921 **153**	Sept. 1920 **247**	**100**
Street Railway Wages*	Oct. 1922 **208**	Sept. 1922 **208**	Oct. 1921 **214**	Sept. 1920 **232**	**100**
Steel Unfilled orders (Million tons)	Sept. 30 1922 **6.69**	Aug. 31 1922 **5.95**	Sept. 30 1921 **4.56**	Apr. 30 1917 **12.18**	**5.91**
U.S. Bank Clearings Outside N. Y. City (Billions)	Sept. 1922 **12.82**	Aug. 1922 **12.34**	Sept. 1921 **11.47**	March 1920 **18.54**	Av. Mo. 1913 **6.12**
Business Failures Number	Sept. 1922 **1,469**	Aug. 1922 **1,689**	Sept. 1921 **1,618**	Jan. 1922 **2,722**	Av. Mo. 1913 **1,213**
Liabilities (millions)	**31.92**	**36.83**	**46.02**	**105.7**	**24.64**

Conspectus of Indexes for Oct., 1922

Compiled for Publication in this Paper by

Albert S. Richey
Electric Railway Engineer
Worcester, Mass.

	Latest	Month Ago	Year Ago	Peak	1913
Eng. News-Record Construction costs	Oct. 1922 **188.6**	Sept. 1922 **185.0**	Oct. 1921 **182.6**	June 1920 **273.8**	**100**
U.S. Bur. Lab. Stat. Wholesale Commodities	Sept. 1922 **153**	Aug. 1922 **155**	Sept. 1921 **141**	May 1920 **247**	**100**
Bradstreet's Wholesale Commodities	Oct. 1 1922 **12.50**	Sept. 1 1922 **12.08**	Oct. 1 1921 **11.19**	Feb. 1 1920 **20.87**	**9.21**
Dun's Wholesale Commodities	Oct. 1 1922 **175.6**	Sept. 1 1922 **172.5**	Oct. 1 1921 **161.8**	May 1 1920 **263.3**	**120.9**
U.S. Bur. Lab. Stat. Retail food	Sept. 1922 **140**	Aug. 1922 **139**	Sept. 1921 **153**	June 1920 **219**	**100**
Nat. Ind. Conf. Bd. Cost of living	Sept. 1922 **155.6**	Aug. 1922 **154.5**	Sept. 1921 **164.8**	July 1920 **204.5**	(1914) **100**

*The three index numbers marked with an asterisk are computed by Mr. Richey, as follows: Fares index is average street railway fare in all United States cities with a population of 50,000 or over except New York City, and weighted according to population.

Street Railway Materials index is relative average price of materials (including fuel) used in street railway operation and maintenance, weighted according to average use of such materials. Wages index is relative average maximum hourly wage of motormen and conductors on 105 street and interurban railways in the United States, operating more than 100 passenger cars each, and weighted according to number of cars.

Traffic and Transportation

Jitneys Menace Houston

$1,200,000 Program of Improvements Halted Pending Relief to Company by City

The City Council of Houston, Tex., has not yet taken action on the petition of the Houston Electric Company, seeking an increase in fares from 7 cents to 9 cents. When the request was presented by Luke C. Bradley, district representative for Stone & Webster, the City Council called on Mr. Bradley for additional information regarding the financial condition of the company.

At a hearing before the Council Mr. Bradley and W. E. Wood, general manager, presented a detailed financial statement showing that the company is earning less than 1 per cent on its invested capital. Operation of jitneys in competition with the cars was blamed for the depleted financial condition of the company. The request for increased fares came just two weeks after the company asked the Council to prohibit jitneys from competing with the street cars.

According to the financial statement presented by Mr. Bradley, the Houston Electric Company during six months ended Aug. 31, 1922, reported total revenue of $1,003,870. Expenses were: Operating, $773,093.17; depreciation, $140,252.07; taxes, $70,010.02, making total operating costs $983,355.26. This left a balance of $20,515.27 for income return during the six months period.

Under the terms of the agreement entered into last January between the company and the city, at the time the franchise was extended for a period of fifteen years, the company agreed to spend $1,200,000 on improvements and betterments within the period of one year. The statement presented by Mr. Bradley showed that to date the company had spent $650,515 on improvements. He added that all improvement work had been ordered stopped by the company pending an adjustment of the fare issues.

City officials charged the company with breach of promise in ordering work stopped on the improvement program. The traction men countered by declaring that the company was on the brink of bankruptcy and that unless the city extended help to it, the company would be compelled to seek other relief. An extreme measure would be for the company to bring suit in Federal court, alleging that fares imposed in the city are confiscatory. It will be recalled that the Houston Electric Company once before secured relief through the channel of the Federal court, and under the decision rendered at that time the fare was increased from 5 cents to 7 cents.

Mr. Bradley told the Council that his company could borrow no more money, and that it had been found impossible to continue the improvement program as planned.

The question of barring jitneys from the streets of Houston has been referred to the voters to be decided at the general election on Nov. 7. It was hinted by Mr. Bradley that the company would not stand by the results of that election, for it would be impossible to compete with the jitneys, and if relief was not forthcoming the company would be compelled to seek some measure of relief in the Federal courts.

Increases in Fares a Political Issue

Figures made public by the Public Service Commission at Albany, N. Y., on Oct. 19 showed that in thirty-one cities fares were increased under affirmative orders by the Public Service Commission in office under Alfred Smith as Governor, while the up-state commission appointed by Governor Miller soon after he took office had increased fares in only two cities in eighteen months.

Increases of 2 cents in fifteen cities and 1 cent in sixteen other cities were granted by the Smith commission. These increases were granted in the period between April 1, 1920, and April 25, 1921. In two cities, Poughkeepsie and Oneonta, two increases were put into effect, each of 1 cent.

Fares were increased from 5 to 6 cents in Binghamton, Elmira and White Plains; from 6 to 8 cents in Amsterdam, Auburn, Geneva, Gloversville, Hornell, Johnstown and Syracuse; from 6 to 7 cents in Glens Falls, Kingston, Mechanicsville, Newburgh, Poughkeepsie, Saratoga and Schenectady; from 7 to 8 cents in Albany, Ithaca, Jamestown, Oneonta, Port Jervis and Poughkeepsie; from 5 to 7 cents in Cortland, Glen Cove, Middletown, Oneonta, Plattsburg, Rochester, Rome and Watertown.

The commission appointed by Governor Miller equalized the fares in Albany, Troy and other cities on the United Traction system which serves these cities and Watervliet, Cohoes and Green Island, necessitating increases in Troy, Watervliet, Rensselaer, which formerly had been upheld in antiquated franchise fare limit, making Albany pay 8 cents a ride, while the other cities paid 5 and 6 cents. The fare in Albany was reduced by the present commission to 7 cents and the fares in the other cities were increased to 7 cents, thereby equalizing fares on the entire system. Decreases also were decreed in Auburn and Syracuse.

An appeal for higher fare in Utica was denied, but the company appealed to the courts and the Appellate Division annulled the commission's denial.

Minnesota Rate Act Attacked

The Brooks-Coleman act, passed in 1920 and putting rate control of electric railways into the hands of the State Railroad & Warehouse Commission, has become a factor in the campaigning by candidates for election to the Legislature in Minnesota. Senator W. F. Brooks, one of the authors of the law, has taken up explanation of the law, conditions prevailing before its passage, and the effects of the act. He is candidate for re-election. This law, next to the half-backed automobile tax enactment, has, perhaps, created more general interest than any other piece of legislation passed at the last biennial session. Out of it has grown a lot of litigation affecting the valuation of electric railways as a basis for the establishment of permanent rates, and as yet only temporary rates have been made, except in the case of Duluth.

In his opening talk Senator Brooks said there has never been a measure so misunderstood and so generally misrepresented. He had no apologies to make for the bill. Inasmuch as no attempt had been made previously to show how the law aims to protect the interests of the three factors involved, the city, company and riders, he said:

> The bill gives to the electric railway a fair return on the value of its property as determined by an exact appraisal. It gives to the carriers the best of service at the lowest possible cost. It gives to the city of Minneapolis complete control of the operation and finances of the company. The bill provides fully the methods whereby the company property may be obtained by the city for municipal ownership and operation. I know if the citizens of Minneapolis could understand the fundamental principles underlying this bill and the absolute necessity for its passage and the effect of the bill when put in operation many who are now opposing it will join with myself and the other members of the Legislature who voted for it and give it their approval and support.

Six-Cent Fare for East Cleveland

Passengers in East Cleveland, Ohio, will pay a 6-cent fare beginning June 19, 1923, as a result of the decision of the board of arbitration. Up to this time the fare in East Cleveland has been the same as that in Cleveland, which is now 5 cents.

The arbitration board was named when the Cleveland Railway insisted upon an increased rate under the terms of its franchise. The arbitrators were Fielder Sanders, former city street railway commissioner, representing the company, John W. Leadley, consulting engineer, representing East Cleveland, and Attorney Charles Higley, selected by the other two arbitrators.

The arbitration board in fixing a 6-cent rate also authorized the company to sell nine tickets for 50 cents and charge 1 cent for a transfer.

"We feel the decision of the arbitration board is fair," said W. M. Pattison, chairman of the East Cleveland City Commission. "East Cleveland people do not believe they are being imposed upon in being required to pay a cent more than a car ride costs in Cleveland in view of the longer distance. Then, too, we expect that Cleveland car fare may soon again go to 6 cents."

Hearing on Validity of Dallas Six-Cent Fare Ordinance

A hearing was set for Oct. 21 on the injunction case involving the validity of the 6-cent fare extension ordinance passed by the city of Dallas, Tex., now on appeal before the Court of Civil Appeals for the Fifth Supreme Judicial District of Texas at Dallas. The original petition seeking an injunction restraining the officials of the Dallas Railway from collecting 6-cent fares was filed by F. J. Geller and others in the Forty-fourth District Court and was heard by special Judge John W. Pope, who sustained the general demurrer filed by counsel for the company setting forth that the company was not properly a party to the suit; that it was acting merely under authority granted by the city in enactment of the 6-cent fare ordinance.

Action has not yet been taken on the petition for mandamus filed by W. S. Bramlett, et al., seeking to compel the City Commission to take action on a petition for referendum of the 6-cent fare extension ordinance under provisions of the city charter. City Attorney James J. Collins held that the fare extension ordinance was enacted with the emergency clause, and thereby was not subject to the referendum provisions of the charter.

Malden Protests Use of One-Man Car

The city government of Malden, one of the largest suburbs of Boston, has voted to ask for the discontinuance of one-man cars in that city, served by the Boston Elevated Railway. The matter has been brought officially before the Massachusetts Department of Public Utilities, so that it will have to be officially determined. At a public hearing before the department, members of the city government and of the Malden Chamber of Commerce declared that the situation created by the use of one-man cars is a menace to the whole community. The cars used were said to be the old type large semi-convertible cars that had been built for two-man operation and have been changed over for use as one-man cars.

Henry C. Atwill, chairman of the Department of Public Utilities, expressed a doubt, however, that his commission has any power to act on the petition. He said that last year the commission issued an order relative to the operation of one-man cars over a grade crossing, under a provision in law relative to grade crossings, but beyond such regulation he thought the commission had no power.

Counsel for the Boston Elevated, H. Ware Barnum. contends that the Public Utilities Department has no authority to order the one-man car off the street, that if it is to be ordered off by legislation the law will have to apply to all the railways in the State. So far as accidents are concerned, he said that the records show fewer accidents with one-man cars than with the two-man cars.

Freight Via Motor Truck Not Contemplated

Railroads, steam and electric interurbans, in California are not at present planning to pick up freight at its source through the use of motor trucks, as had been reported in traffic circles. Motor truck freight companies, which have been annexing considerable short-haul freight traffic formerly handled by railroads, have been fearing such eventuality, but according to J. T. Saunders, general freight agent of the Southern Pacific Lines in Los Angeles, there is little probability of the railroads attempting to compete with the motor trucks for the short-haul business now.

Although the truck companies have made substantial inroads on the revenues of the railroads, Mr. Saunders asserts that the railroads are helpless until the trucks are compelled to pay taxes on their gross revenues and bear their portion of maintaining state highways. When this accomplished, both carriers will be on a more equitable basis of competition.

The function of the truck, in the opinion of Mr. Saunders, is to serve the railroads by transporting freight from the surrounding country, and not in attempting to parallel the railroad lines with their routes. The railroads cannot attempt to compete with the motor truck companies on short-haul freight by operating a fleet of trucks to secure the freight at the source and convey it to the cars, which has been attempted by several other lines in large cities throughout the country. This practice is not sufficiently successful to warrant general extension because the truck companies have been able to easily undercut the railroads.

The city short haul belongs primarily to the express companies, and if the railroads should enter this field with a truck pickup service, they would be competing with the express carriers, one of the best customers of the rail lines. It may be that in time the express companies will be controlled by the railroads, and if such development materializes, the carriers would be in a better position to go after the city short-haul business in competition with the truck companies.

The growth of the motor truck business is similar to the development of the electric railway. Electric lines were able to divert the large amount of suburban traffic that had gone to the steam lines, and in order to protect themselves, the railroads have pursued the policy of acquiring the electric lines as feeders.

Some such development may take place with the truck problem. If the railroads are allowed to compete with the trucks on a fair basis, there is a likelihood of the rail lines operating truck routes into the back country to facilitate greater freight shipments.

More Five-Cent Lines in Boston

Announcement was made on Oct. 18 by Edward Dana, manager of the Boston Elevated Railway, that plans are under way for extending the 5-cent fare zones on the "L" system as a result of the increased traffic in zones already established and the decrease in the annual deficit. Mr. Dana said:

> We are making and will continue to make every effort to extend the 5-cent fare. Of course when you enter the rapid transit subway, the fare is still 10 cents, and may continue to be.
>
> But our trustees have made a careful survey of the situation on our road, and there is no doubt that as a result of their findings there will be an extension of the 5-cent fare. Generally, however, it is unwise to compare Boston with any other city from viewpoint of transportation. The city has conditions that are unique.

During the month of September of this year, with the 5-cent fare operative in some zones, the Elevated carried 28,357,507 passengers. In September, 1921, the total of passengers carried was only 26,613,458. The deficit this year was $364,000 as compared to $466,000 last year. Despite the reduction of fares there was an increase in mile trips to the extent of 133,000 during the last fiscal year, an increase of 36,000 trips over the previous year.

The total revenue for September, 1921, was $2,566,985. Last month it was $2,572,047. In 1921 the cost of service was $2,716,381. This year it was $2,615,095. The cost of service over receipts in 1921 was $149,395; this year it was $43,048. At present the 10-cent fare in Boston allows a ride of 22 miles, whereas the 5-cent ride averages only 3 miles.

Motormen and Policemen Co-operate

For the purpose of bettering the co-operation between traffic policemen and motormen the Louisville (Ky.) Railway has extended an invitation to all members of the Board of Public Safety, the chief of police and members of the city police traffic squad to attend the monthly dinner given by the company to the carhouse with the smallest number of accidents for the month. Arrangements were made for a dinner on Monday, Oct. 16, at noon for the late-run men, and at 7:30 in the evening for the day men, so that all policemen and street car men could attend.

The dinner for low accidents was captured by the Market Street carhouse during September, and incidentally the same house captured the event in September, 1921, and hadn't won it since that time. The average for the month was 8,000 car-miles per accident.

Police Judge Eugene M. Daily, who has broken up a lot of speeding in Louisville, through fines of $2 a mile per speed of motorists captured, and Alfred Selligman, attorney, with the accident department of the company, were the principal speakers on Oct. 16.

It is recognized that the motormen and traffic policemen are in close daily contact, and that through co-operation, the safety work of each can be made more effective.

Jitney Men Lose

Operators in San Antonio Must Desist From Competition With Public Service Company

Jitney men in San Antonio, Tex., have lost their fight in the higher courts against the ordinance enacted by the City Commission of San Antonio to stop the operation of jitneys in competition with the cars of the Public Service Company. The Supreme Court at Austin has just upheld the judgment of the Court of Civil Appeals for the Fourth Judicial District. The Court of Civil Appeals previously reversed the finding of the District Court in granting a temporary injunction restraining the city of San Antonio from enforcing the terms of the jitney ordinance pending hearing adjudication of the case on its merits.

The San Antonio jitney ordinance was enacted last January. It prohibited the operation of jitneys on certain streets, which in effect prevented the jitneys from running in competition with the traction company, for the only streets on which the jitneys were permitted to operate were those on which no street cars were operated. When the ordinance went into effect, A. Fetzer, and others acting for the jitney operators, filed suit for injunction in the Fifty-seventh District Court. After a hearing a temporary restraining order was granted. This temporary restraining order in effect nullified the provisions of the jitney ordinance and permitted the jitneys to operate unrestrained pending final disposition of the case.

The city took an appeal to the Fourth Court of Civil Appeals, and on hearing the case was reversed. Fetzer then sought a writ of error to the Supreme Court, and in denying this writ the Supreme Court in effect sustained the findings of the Fourth Court of Civil Appeals and denied the writ sought by the jitney men.

In seeking a writ of error to the Supreme Court, the jitney operators alleged that the city ordinance in question was "arbitrarily and capriciously passed for the sole purpose of prohibiting the operation of jitneys over the streets of the city, and that if enforced would have that effect."

It was further alleged that no necessity existed for so prohibiting the operation of jitneys, and averment was made that the ordinance was passed pursuant to a contract made by the city with the Public Service Company of San Antonio, whereby that company agreed to reduce fares to 6 cents provided the city passed and enforced ordinances prohibiting jitneys being operated over the streets of the city.

Business of Freight Traffic Increases

Figures compiled by the traffic department of the Salt Lake & Utah Railroad, Salt Lake City, Utah, reflect a vigorous development of interurban freight traffic. Estimates based on performance of the first eight months of the year indicate that carload freight shipments over the Salt Lake & Utah in 1922 will show an increase of approximately 400 per cent above those of 1916. Included in this estimate only eight principal commodities are considered.

Taking the actual carload shipments handled in former years, the following table shows the steady growth of freight traffic since 1916, the shipments of 1916 being used as 100 per cent basis:

Year.	Cars.	Per Cent.
1916	2,206	100
1917	3,215	146
1918	3,919	178
1919	7,001	318
1920	9,036	410
1921	6,619	300
1922	11,150	505

Transportation News Notes

Opposed to Bus Line.—The Tucson (Ariz.) Rapid Transit Company is protesting the proposed motor bus line into the northern and eastern sections of Tucson, claiming that all the traffic is necessary to its existence and operation. On Sept. 23 the Arizona Corporation Commission convened for a hearing on the application for such motor bus line.

More One-Man Cars for Shreveport.—The Shreveport (La.) Railways has asked the City Commission for permission to substitute one-man safety cars for the present cars on the Fairfield line. It is asserted that if the company is permitted to substitute one-man cars it will be able to improve the service and at the same time eliminate a daily deficit of $50. One-man cars have been in use on the Union Depot line for several months.

Arranging for Special Trains.—The Columbus, Indiana & Eastern and the Columbus, Newark & Zanesville traction lines, in Springfield, Ohio, are making a determined drive to secure "special car" trade which is having good results. The companies have booked a number of special train movements to conventions and football games for the next few weeks. Plans to operate special trains from outlying communities to Springfield for events at memorial hall during the coming season have also been arranged.

Experiments with Remodeled Car.—The operation between Maplewood and Dover of one of the remodeled cars of the Morris County Traction Company, Morriston, N. J., with entrance and exit at one end marks an experiment by the traction company prior to the proposed conversion of all its large two-men crew cars into the pay-as-you-leave cars with one operator. The traction company has several of the small trolley cars operated by one man on its short runs between Maplewood, Springfield and Elizabeth and Morristown and Morris Plains.

Reduction in Fares Asked in Washington.—The Public Utilities Commission of the District of Columbia will grant a formal public hearing on the application of the Federation of Citizens' Associations for a reduction in fare on the lines of the Capital Traction Company. Date of the hearing will be announced later. John H. Hanna vice-president and general manager of the company, said that with passenger traffic declining and the cost of coal and supplies going up, he did not regard this as a propitious time to talk about fare reductions. Mr. Hanna said he would be prepared to give exact figures on the company's earnings or operating expenses when the hearing is held.

Jitneys Regulated by Texas Cities.—At the request of the Waco (Tex.) Traction Company, the Waco City Commission has enacted an ordinance regulating jitneys and other passenger-carrying vehicles. The new ordinance prohibits drivers of such vehicles from soliciting passengers on any street on which street cars are operated, unless to fill a previously made engagement. The City of Temple, Tex., has also enacted an ordinance to regulate the operation of jitneys in that city. The new ordinance fixes a license fee of $25 payable at time of application, for a permit to operate, which is not refundable if the jitney is in operation for less than one year.

Parking Ordinance Upheld.—Cities and towns in Oklahoma are exercising their lawful police powers in enacting ordinances prescribing zones in which jitneys and motor trucks operated for hire are to be parked under a decision in the Criminal Court of Appeals, which denied a writ of habeas corpus in the case of A. McGuire of Pawhuska. In the case the complainant alleged that the City of Pawhuska in enacting and enforcing an ordinance fixing the zones in which jitneys may be parked was in effect depriving the owners of such jitneys of their property without due process of law. The court held that this was not the case and that the town had full authority to enact and enforce such ordinance.

Postpones One-Man Car Operation.—The Public Service Railway, Newark, N. J., has postponed the proposed one-man trolley service on the Collingswood and Haddonfield lines as a result of a conference of representatives of the men with Martin Schreiber, manager of the southern division of the railway. The men were concerned about their ability to operate the one-man cars successfully during rush hours because of the heavy traffic on Haddon Avenue and Federal Street, Camden. They were reassured by the company on the point of possible reduction of the force. One-man cars are now being operated on the Cramer Hill, Woodlynne, Crosstown and Merchantville lines.

Legal Notes

CALIFORNIA—*Ineffective Fenders Held Not Proximate Cause of Death of Negligent Pedestrian.*

Where a pedestrian was negligent in stepping upon the track immediately in front of approaching car, the negligence, if any, of the railway company in failing to equip the car with effective fenders was not the proximate cause of the pedestrian's death and it was error to instruct the jury that, even if deceased was negligent, defendant was liable if they further found that if the car at that time had been equipped with a suitable fender, deceased would not have been killed. [Schooley vs. Fresno Traction Co., 206 Pacific Rep., 481.]

FEDERAL COURTS — *Testimony of Various Car Men that They Did Not See Plaintiff Attempt to Board Street Car Held Admissible.*

Where, in an action for personal injuries occasioned by attempting to board a street car, the particular car had not been identified, it was permissible for the company to call the motormen and conductors on cars that had passed the place of injury at or near the time thereof, to testify that they did not see the plaintiff, and knew nothing about the accident. [Fels vs. East St. Louis & S. Ry. Co., 275 Federal Rep. 882.]

GEORGIA — *Street Railway Company Must Bear Expense of Crossing.*

A steam railroad company which had received a perpetual right-of-way in a city street, laid one track, and after the construction across it of a street railway laid another track, and subsequently shifted its tracks in connection with the building of a depot but within the right of way granted. In a suit to determine which company should bear the expense of maintenance of the relocated and new crossing, it was held that the steam railroad was the senior company in occupation with respect to both tracks, and not to have relocated its tracks by such shifting, and that the electric railway company, at whose instance the crossing was first installed, must bear the expense. [Macon Ry. & Light Co. vs. Southern Ry., 110 Southeast, Rep. 912.]

ILLINOIS — *Conditions Under Which Railway Property May Be Assessed for Street Improvements.*

Where property has for years been devoted to street railway purposes, and the evidence tends to show that it will continue so to be used for years to come, the only basis upon which a special assessment for street improvements may be levied against it is that the property will be benefited by the proposed improvement. For such purpose, the street railway property has no market value in the sense in which that term is ordinarily used, and, on objection by the street railway to assessment for improvements in street, the court erred in permitting an expert to testify that the property would sell for at least $16 per foot more after the improvement than before. [City of Chicago vs. Chicago City Ry. Co., 134 Northesat. Rep. 44.]

LOUISIANA — *Duty of Street Car Company to Prevent Obstruction of Platform by Objects Endangering Alighting Passengers.*

A street railway company owes to its passengers the duty to prevent the obstruction of the platforms by baskets or other objects which would endanger passengers when alighting. [Hopkins vs. New Orelans Railway & Light Co., 90 Southern Rep. 512.]

MICHIGAN—*Carrier Not Liable for Injury to Passenger Thrown Down by Speed of Car in Rounding Curve.*

A street railway company is not liable for injury to a passenger, who is thrown before he reached a seat, due to the rapid speed of the car necessary and incidental to efficient operating in rounding a curve immediately after starting. [Clifford vs. Detroit United Ry., 185 Northwest. Rep. 741.]

MARYLAND—*Company Held Liable for Death from Wire Broken by Fallen Limb of Tree if Chargeable with Knowledge of Decayed Condition of Tree.*

Where a large limb of a decayed tree extending out over a public highway broke and caused a railway transmission wire to come into contact with a wire fence, the railway was liable for injuries caused by contact with wire fence if, by the exercise of proper care, it could have known that the limb would probably fall and break its wires and did nothing to protect the public, even though the tree was situated on private property. [Hagerstown & Frederick Ry. Co. vs. State, 115 Altantic Rep. 783.]

MONTANA—*Verdict Exonerating Servant Releases Master.*

In an action for personal injury against a street car conductor and the company, where the company can be held liable only on the doctrine of respondeat superior, a verdict exonerating the conductor, while finding against the company, is inconsistent; the finding by the jury which will support one verdict would make the other one impossible. [Lowney vs. Butte Electric Ry. Co., 204 Pacific Rep. 485.]

NEW JERSEY — *Permission of Board of Public Utility Commissioners Necessary for Jitney Operation.*

A jitney which operates on a route parallel upon the same street to the line of a street railway, is a public utility. As such it must obtain permission to operate from the Public Utility Commission as required by Sec. 24 of the Public Utility Act, and municipal consent to operation is invalid without this permission. [Public Service Ry. Co. vs. Board of Public Utility Com'rs et al., 116 Atlant. Rep. 274.]

NEW JERSEY—*Users of Crossing Over Private Right of Way Without Consent Trespassers and Not Entitled to Warning.*

Where a crossing was constructed over a private right-of-way and track of a railway company without the consent or permission of the company and was used without invitation, the company is not guilty of willful or wanton injury if one of its cars strikes and damages a truck using the crossing, although the company has knowledge that the crossing is being used, and the view of a car approaching the crossing is somewhat obscured by shrubbery. [Staub vs. Public Service Railway, 117 Atlant. Rep. 48.]

NEW YORK—*Injury to Employee While Riding to Work on Pass Held Not to Be "Arising Out of Employment."*

Where a railway employee was riding on a pass to work but was injured before he reached the place where his employment began and before the time for which he was to be paid, the accident was not one arising out of his employment within Workmen's Compensation Law, and his representative could recover damages for his death in an action based on the theory he was a passenger. [Tallon vs. Interborough Rapid Transit Co., 134 Northeast. Rep. 327.]

PENNSYLVANIA—*Contract Not Consummated Because Terms Not Complied With.*

Where a railway wrote to a manufacturer asking the price on certain goods with terms, and the manufacturer gave price and terms, and the railway then replied, stating somewhat different terms, naming a consignee to whom the goods were to be shipped, a limit of time for shipment, and a certain place for delivery, there was no completed contract, where plaintiff did not reply to the last letter, but shipped the goods, consigned to itself, to a place other than that named by defendent. [Frick & Lindsay vs. Johnstown & S. Ry. Co., 115 Atlantic Rep. 837.]

SOUTH DAKOTA — *Knowledge of Peril Necessary Under Last Clear Chance Doctrine.*

Under the last clear chance doctrine, the defendant must have had actual knowledge of plaintiff's peril, and is not liable merely because he ought to have known thereof; the mere fact that he could have discovered the peril being insufficient. [Miller vs. Sioux Falls Traction System, 184 Northwest. Rep. 233.]

Personal Mention

L. A. Lovell Made Auditor

On Sept. 13 the board of directors of the Pacific Electric Railway, Los Angeles, Cal., announced the appointment of L. A. Lovell as auditor and secretary to succeed H. A. Culloden, who resigned to become auditor of the Minaret & Western Railway and its subsidiary companies at Fresno, Cal.

Mr. Lovell entered the service of the Pacific Electric Railway in 1901 with that portion of the present consolidated company known as the Pasadena-Los Angeles Electric Railway in the capacity of bookkeeper. During Mr. Lovell's twenty-one years of service with the company he has held various positions in the accounting department, including those of general bookkeeper and chief clerk. At the time of his appointment he held the position of special auditor.

L. A. LOVELL

Municipal Manager on Leave of Absence

Joseph S. Goodwin, general manager of the Detroit (Mich.) Municipal Railway, has been granted a six months leave of absence by the Detroit Street Railway Commission, due to ill health, and Mayor Couzens has announced that he will take active charge of the management of the railway during Mr. Goodwin's absence on leave. After being ordered by his physicians to take a complete rest, the general manager sent a letter to the Mayor explaining that after two weeks of observation at Harper Hospital he felt that in justice to himself and the Department of Street Railways he should relinquish, for the present, his active participation as head of the department.

Mr. Goodwin in his communication thanked the commissioners for the splendid co-operation and support which were rendered him at all times and assured them that he is determined to be back in fit condition energetically to push the progress of the department's affairs.

The commissioner agreed to grant Mr. Goodwin leave of absence on half pay and it has also been agreed between the Mayor and the commissioners not to appoint anyone to take Mr. Goodwin's place. The members of the commission and the Mayor will from now on devote more of their own time to the conduct of the department, the Mayor agreeing to spend a half of each day at the department headquarters during Mr. Goodwin's absence.

Paper Praises T. F. Hill

Among prominent men in Anderson, S. C., is Thomas F. Hill, superintendent of the commercial and railway departments of the local branch of the Southern Public Utilities Company. The Anderson *Tribune*, in fact, thought Mr. Hill of such importance that he was made the subject of a sketch in a series called "Anderson Men of Today." He is placed in the Anderson hall of fame for his ability to win friendships and his earnestness and interest in his work, qualities especially to be desired in an official of a public utility company.

After being graduated from Wofford College, Mr. Hill for a short time was baggage clerk for the Blue Ridge Railroad. He soon started work with the Anderson Traction Company, and when this company was purchased by the Southern Power Company Mr. Hill was made superintendent of the system. Later he took up his present work as superintendent of the commercial and railway departments.

Mr. McLimont Is Honor Guest at Dinner

To celebrate the fifth anniversary of his association with the Winnipeg (Man.) Electric Railway, officers and department heads of the company gave a dinner to A. W. McLimont at the Royal Alexandra Hotel on Oct. 11. The banquet was not only in honor of the fact that Mr. McLimont, vice-president and general manager, had been with the company five years, but because, as stated by one of the company, he "has successfully eliminated jitney competition, succeeded in getting the fares raised, has almost completely rehabilitated the property, and has completely transformed public opinion from being adverse to the company to now being favorable," and "because he has won the confidence of everyone."

Mr. McLimont stated that efficient selling of the electric railway product will remove the necessity of government regulating bodies and will "remove from politics the use of the public services of the communities as political footballs."

Mr. Wood Bus Head

Manager for Receiver of New York Railways Elected to Guide Fifth Avenue Coach Company

Frederic T. Wood, who has been identified with the transportation development of New York City for more than twenty years and who most recently was assistant to Job E. Hedges, receiver for the New York Railways, has been elected president and general manager of the New York Transportation Company and the Fifth Avenue Coach Company. Mr. Wood succeeds John A. Ritchie, who resigned recently to become head of the reorganized Chicago Motor Bus Company and the American Motor Bus Corporation.

Mr. Wood brings to the Fifth Avenue Coach Company a wide knowledge of bus transportation, gained through years of trained observation and actual experience in New York City and in the principal capitals of Europe. He was trained in the same school of transportation as Mr. Ritchie and possesses the same aims and ideals. It is Mr. Wood's objective to carry on the same principles that have made the Fifth Avenue Coach Company one of the most talked of transportation systems in the country.

F. T. WOOD

Mr. Wood is a graduate of Williams College, through which he worked his way. He entered the transportation business twenty years ago with the old Interurban Street Railway at the office of the company in Christopher Street. That was in the horse car days. He has been identified with every progressive movement in transportation in the city since then and enters the motor coach field with a singular knowledge of the ways and means of constructing and maintaining a modern public service corporation. For the time being, at least, Mr. Wood also will fill the vacancy caused by the resignation of George A. Green, vice-president, general manager and chief engineer of the Fifth Avenue Company, who will join Mr. Ritchie in Chicago.

Mr. Wood is a trustee of Williams College and was president of the Williams Club for two years.

John Garrett Barry—*An Appreciation*

His Recent Appointment as a Vice-President of the General Electric Company Celebrated at a Dinner Given by His Friends as a Tribute to His Great Service to the Industry

ON Thursday evening at the Hotel Commodore, New York, a company of more than 175 men prominent in the electric railway industry gathered at a dinner given in honor of John Garrett Barry. It was a personal tribute from old friends, in celebration of Mr. Barry's recent appointment as a vice-president of the General Electric Company. It voiced a universal sentiment among the men both of the railways and the railway supply manufacturers, a recognition of the distinguished services which Mr. Barry has rendered to the industry during the twenty-eight years that he has been active in this field.

For Mr. Barry has been a great constructive influence in railway affairs. As a member of the executive committee of the American Electric Railway Association he has long been in the inner counsels and has helped to guide the organization and the industry through one of the most difficult periods of railway history. As one of the three members of the finance committee, created last year, he has been most instrumental in placing the association's management and operation on a real financial basis. He has been a great conservative force, a source of sound judgment, but above all else a strength in action, a power for getting things done. This is probably the outstanding characteristic of Mr. Barry's appealing personality, responsible in large measure for his remarkable success.

The story of Mr. Barry's career is an interesting one. He was born in Boston in 1868 and was graduated from the Boston High School at seventeen and went directly to work. Some five years later he entered the employ of the Thomson-Houston Company at Lynn in the training course of the construction department. After a year he went to the Boston office and in 1894 when the General Electric Company was formed he transferred to the railway department, then one of the two major divisions of the company. The problems and opportunities of these pioneer days in electric railroading appealed to Mr. Barry strongly. There was work to be done. There were obstacles to be surmounted. There were puzzling situations to be thought through, as in the creation of any new industry. He became intensely interested and set himself to the task of helping to solve these problems and to develop these opportunities with the belief that the street railway might be lifted through successful electrification to an entirely new plane of public service.

From that time on Mr. Barry has been a conspicuous figure in the evolution of this important branch of the electrical industry. He has a tremendous capacity for work, fortunately coupled with perfect health and a temperament that maintains a good natured poise, proof against the worry and excitement that drag down so many men. He possesses an ability to drive himself under close concentration. He is regular, systematic and rapid in his work and quick in his decisions. All this carried him ahead and in three years he was assistant manager of the department. By 1907 he was manager.

JOHN GARRETT BARRY

The business side of the industry attracted Mr. Barry more than the technical. The practical problems of organization, finance and management in these early days of expansion were ever present and here his sound judgment and clear vision served him and the industry well. Also he is a man of great human understanding and he has the wonderful gift of inspiring men to loyalty, enthusiasm and effort. He therefore soon developed marked organizing ability and strong qualities of leadership and in 1917 was rewarded with appointment to the position of general sales manager of the company, while still retaining the direction of the railway department. Then last June came the further advancement to a vice-presidency, after thirty-two years of service.

If there is one thing that has distinguished the work of John Barry, it has been this remarkable ability of his to get things done. Men turn to him in difficulties and he is ever ready to undertake the task if he feels its urgency and thinks that he can help. But he is a believer in facts. His experience in the affairs of the industry has been a broad one. And he draws on this experience for the knowledge on which he forms his well balanced judgments and supports his vision. Mr. Barry has, therefore, brought great impulse to the promotion of research and development. He has defended this fundamental of progress against the restricting influences of economy programs. And yet, though ready to spend money without hesitation in this creative work, his influence has ever been to steady and make sure. What interests him most, however, is always the practical opportunity to get some good thing done.

Mr. Barry's record is not one of spectacular high spots. He is distinctly the wheel-horse type, self-made. But linked with his great personal capacity for work is his broad human sympathy that has won him a host of friends who admire and love him and has given him knowledge of men. He is a good judge of what people will think and do. In fact, one of his great services to the American Electric Railway Association has been his almost unfailing ability to interpret the point of view of the manufacturers on matters affecting the industry broadly and to guide the councils wisely in the common interest. He is a strong man and he has been intensely occupied, but he has ever maintained the closest human contact with the men with whom he has been associated and devoted a large amount of thought and time to the encouragement and development of young men and the upbuilding of loyalty and higher ideals of achievement in any organization with which he has been connected. His promotion as vice-president of the General Electric Company has been called "the most popular appointment of recent years."

At the dinner Toastmaster Frank Hedley, president of the Interborough Rapid Transit Company, epitomizing the speakers of the evening, pictured Mr. Barry in these words:

> John Barry is a deserving boy from the East who has grown up and developed by his own personal energies. Those energies were recognized by his superiors, and they have put him up and up—not in order to help John Barry, but in order always to put the best man in the job. We regard John Barry as a real man among men.

Joseph K. Choate, vice-president of the J. G. White Management Corporation, said:

> Barry was not a technically educated man, but after he got through with his technical associates and then with those with whom he tried to trade, he became more of a technical man than those who tried to teach him that he was not a technical man.

Gerard Swope, president of the General Electric Company, said that people always knew where Mr. Barry stood. It was a great satisfaction to him when Mr. Barry was made vice-president, and this satisfaction was greatly increased when he realized the respect in which Mr. Barry was held in all parts of the country. J. R. Lovejoy, vice-president of the General Electric Company; Daniel W. Smith, Detroit; Charles C. Peirce, Boston; Judge Daniel Naylon, Schenectady, and Judge James H. Wilkerson, Chicago, also added their tributes.

Mr. Barry in replying said among other things that naturally he was greatly pleased with his promotion to the vice-presidency of the company, but he was still more pleased and greatly touched by the testimonial which had been extended to him at the dinner. He would regard the evening as one of the happiest experiences of his life.

Mr. Barry is a resident of Schenectady and has given generously to public work as president of the Board of Education and as Fuel Administrator of that district during the war. He is a director in the Schenectady Savings Bank and the Schenectady Trust Company and a member of the Board of Trade. He belongs to the Mohawk Club and Mohawk Golf Club of Schenectady, American Institute of Electrical Engineers, American Electric Railway Association and the Engineers', Bankers' and Lotos Clubs of New York.

Obituary

C. D. Meneely

Charles Dickinson Meneely, vice-president and treasurer of the Brooklyn Rapid Transit Company, died on Oct. 22 at his home in Hempstead of heart disease.

Mr. Meneely was born Aug. 11, 1860, at Watervliet, N. Y. He received his education at the Boys' Academy, Albany, and the Graylock Institution, Williamstown. He was graduated from Union College, Schenectady.

His first business experience he obtained under the guidance of his father in the firm of George R. Meneely & Son, manufacturers of railroad supplies at Watervliet. On Feb. 1, 1896, he came to the Brooklyn Rapid Transit as auditor. Four years later he was elected assistant secretary and treasurer and within a month became secretary and treasurer. He succeeded Col. Timothy S. Williams, who was elected vice-president the same day.

On Feb. 11, 1911, the new office of vice-president and member of the board having been created, Mr. Meneely was chosen by the directors to be its first incumbent. He also filled the position of treasurer. When the B. R. T. went into the hands of a receiver, Dec. 31, 1918, Mr. Meneely was retained by Lindley M. Garrison as treasurer for the receiver.

Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS FOR THE MANUFACTURER, SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES BUSINESS ANNOUNCEMENTS

The Convention Exhibits and the Progress They Typified

Manufacturers Concentrating on Equipment to Reduce Costs, Increase Safety, and Lessen Labor Expense—Complete Display Made of Both Cars and Buses—Maintenance Problem a Topic of Discussion

IN SIZE and variety the exhibits at this year's convention of the American Electric Railway Association met all expectations. The arrangement was particularly effective and the change of surroundings from that of previous conventions added a variety and newness that was pleasing to all. The large number of new devices shown indicated the serious consideration manufacturers are giving toward producing equipment for reducing costs, insuring increased safety and lessening the labor necessary for maintenance and operation. Car builders took advantage of this opportunity to exhibit the latest development in large, light-weight cars for one-man operation. One of the new one-man double truck cars of the Chicago Surface Lines was contrasted with one of the first Chicago horse cars. Exhibits of sweepers, work cars, etc., showed notable advances.

The display of buses and accessories was the most complete ever gathered at any convention. Seven manufacturers exhibited ten city type motor buses, five interurban coaches and two trolley buses, all of which were of the latest design. Comfort for passengers and easy riding were outstanding characteristics. These bus exhibits attracted considerable attention.

The trend of truck construction for electric cars was seen to be toward a simplification of parts and reduction in weight. Several new arrangements of truck brake equipment showed particular advances in simplification. Motor manufacturers laid particular stress on the development of small-sized motors and other equipment for light-weight double-truck cars, laying particular stress on the use of four small motors rather than two larger ones. Important features included light weight, large capacity, self-ventilation and increased strength of parts, due to the use of high-grade materials. Developments in control equipment were toward increased insulation at vital points and liberal contact surfaces to take care of arcing.

Exhibits of car equipment accessories reflected the increasing use of one-man operation and the resulting provisions for lessening the duties of the operator and for increased safety to passengers. Seat designs provided increased comfort for passengers. Electric heaters reduced the fire hazard over former types of such heaters and gave more uniform distribution of heat.

Exhibits of slack adjusters, gear cases, brakes, brake rigging and trolley wheels showed advances toward reducing maintenance costs. The exhibits of door operating mechanisms and equipment, trolley catchers, trolley bases, and hand brakes, showed improvements for lessening the duties of the operator, particularly where one-man operation is used.

The exhibits of fare boxes, registers, change carriers, tickets, and the like were more elaborate than at previous conventions. Provisions for automatic instantaneous registration of fares and reducing the labor of the operator were outstanding characteristics. Thirteen displays of fare boxes of the lock and registering type, change makers, coin counting and separating machine, coin wrappers, ticket and fare registers, badges, etc., showed the completeness of the equipment available to lessen the labor and insure honesty in handling revenue received. Other exhibits of particular interest to those maintaining car equipment consisted of certain fixtures, doors, bearings, carbon brushes, headlights, lighting fixtures, shade holders, hand straps, destination signs, step treads, ventilators, window sash and fixtures, roof materials, side panels, paints, varnishes, wire and cables, fire extinguishers, lock nuts, bolts and washers.

The exhibits of shop tools were confined principally to small equipment, such as jacks, hoists, coil spreaders and winders, and labor saving equipment. Exhibits of sanitary and wash room supplies were very good.

Those responsible for the maintenance of track and line found much to interest them. Various exhibits of rails, substitute ties, special trackwork, and the like were very complete and showed developments to produce longer life with less maintenance. Equipment for track maintenance, such as welders, grinders, and rail benders showed particular advances. The display of overhead and line material offered many useful lessons. New designs of insulators gave increased protection from short circuits and extreme weather conditions. Combination railway and lighting poles showed the tendency toward reducing the amount of property installed on the streets. Exhibits of suspension line material contained everything used from the trolley ear to the section insulator.

Probably one of the greatest advan-

tages which came to those in attendance was from meeting manufacturing experts and through a discussion of problems confronting the men directly responsible for maintenance and operation.

G. H. Knutson Joins Spooner & Merrill

Spooner & Merrill, consulting engineers, Grand Rapids, Mich., announce a new partnership and the opening of a Chicago office in the Harris Trust Building. George Henry Knutson, formerly with the Harris Trust & Savings Bank, has assumed personal charge of the Chicago office as resident partner.

Mr. Knutson, it is understood, expects to confine his activities essentially to "experting," financing and refinancing of public utilities, although he will continue to carry on a general consulting engineeering practice. In several respects the combination of talent as now embraced within the firm is an unusual one. Messrs. Spooner and Merrill are actively engaged in engineering, construction, rate work, appraisals and valuations, and practically everything along consulting engineering lines. Mr. Knutson will be actively engaged in financing, but in addition knows the consulting engineering field. In this way the firm as now constituted offers to investment bankers, trust companies and to industrial enterprises a complete service not ordinarily offered by the consulting engineer or banker.

Both Mr. Spooner and Mr. Merrill are natives of Grand Rapids, and both have degrees in civil engineering from the University of Michigan. Mr. Spooner has had a broad experience in civil engineering and valuation work and as an expert in engineering litigation. Mr. Merrill's work has, perhaps, been a little more closely confined to engineering work in the field. As for Mr. Knutson, he also was graduated from the University of Michigan. His experience has been especially broad, more particularly in the field of financial engineer, in which capacity he has reported on the impending purchases of utility properties and their security issues by bankers and then followed through to their conclusion the issuance of the securities, also looking after the details relative to the fulfillment of the provisions covering the items of sinking funds, reserve funds, maintenance provisions, etc.

Metal, Coal and Material Prices

Metals—New York	Oct. 24, 1922
Copper, electrolytic, cents per lb	13.812
Copper wire base, cents per lb	15.625
Lead, cents per lb	6.55
Zinc, cents per lb	7.35
Tin, Straits, cents per lb	35.375
Bituminous Coal, f.o.b. Mines	
Smokeless mine run, f.o.b. vessel, Hampton Roads, gross tons	$7.125
Somerset mine run, Boston, net tons	3.95
Pittsburgh mine run, Pittsburgh, net tons	3.25
Franklin, Ill., screenings, Chicago, net tons	3.25
Central, Ill., screenings, Chicago, net tons	2.00
Kansas screenings, Kansas City, net tons	2.50
Materials	
Rubber-covered wire, N. Y., No. 14, per 1,000 ft.	6.50
Weatherproof wire base, N.Y., cents per lb.	16.00
Cement, Chicago net prices, without bags	$2.20
Linseed oil (5-bbl. lots), N.Y., cents per gal.	91.50
White lead, (100-lb. keg), N.Y., cents per lb.	11.625
Turpentine, (bbl. lots), N.Y., per gal.	$1.64

Rolling Stock

City Railway, Dayton, Ohio, is rebuilding fifteen of its class 100 cars for one-man operation. The new Cincinnati trucks will be used under these cars to replace Maximum traction trucks.

Grand Rapids (Mich.) Railway is converting seventeen of its closed cars for operation by either one man or two men. As soon as these have been completed it is intended to put an additional twenty cars through the shop for similar changes.

Norfolk & Western Railway Roanoke, Va., has placed an order, through its consulting engineers, for four double cab electric locomotives similar to those now in use on the Elkhorn Grade electrification. These locomotives will be equipped for operation over the alternating-current installation. The capacity of the new locomotive will be somewhat greater than those now in operation, but the design will still maintain the special feature of split-phase operation. The machine will be of the jackshaft and siderod type, weighing approximately 382 tons. This recent addition to the rolling stock is a result of the increased heavy freight traffic.

Track and Roadway

Everett, Wash.—The City Council has accepted a formal agreement embodying terms reached at an informal conference of officials of the city and representatives of the Puget Sound International Railway & Power Company, giving the company an extension of time on paving between tracks on Hewitt Avenue.

New York, N. Y.—The Transit Commission has authorized the construction of an elevated railroad station on the Broadway "L" of the Brooklyn Rapid Transit Company at Williamsburgh Bridge Plaza. The new station is to cost in the neighborhood of $300,000. Plans are now well advanced for the work. The commission has given instructions that they be completed as soon as possible, and that the necessary form of contract be prepared.

Trade Notes

Conveyors Corporation of America, 326 West Madison Street, Chicago, Ill. has appointed the George W. Fife Engineering Company, 1403 Merchants Bank Building, Indianapolis, Ind., its representative for the sale of American trolley carriers in the state of Indiana. The American trolley carrier is equipment for handling coal from railroad cars to bunkers, silos or open storage pile. It consists of an overhead monorail, with a trolley from which a 1-ton bottom dump bucket is suspended.

Dwight P. Robinson & Company, Inc., New York, N. Y., have been awarded a contract for the construction of a cement mill at Birmingham, Ala., for the Lehigh Portland Cement Company of Allentown, Pa. The mill will have a capacity of 1,000,000 bbl. a year.

M. C. McElligott, president of the Canadian Cleveland Fare Box Company, Ltd., Preston, Ont., who also represents the Universal Lubricating Company and other organizations in Canada, is understood to be prepared to take on several new accounts. Mr. McElligott put in more than twenty years in the electric business in the United States, so that he has a real practical knowledge of the business.

"War Surplus," just issued by the Sales Promotion Section of the Office of the Director of Sales, describes in a general way the methods of sale resorted to by the War Department in the disposal of its vast stocks of surplus property and tells what these stocks contain. A loose-leaf insert lists the more important sales scheduled for the near future. Catalogs of sales usually are ready for distribution two weeks before the date of the sale. Requests for catalogs should be made to the Chief Sales Promotion Section, Room 2515, Munitions Building, Washington, D. C.

New Advertising Literature

Sprague Electric Works, New York, N. Y., has issued Sheet No. 67,901, descriptive of the Sprague safety type panelboards and cabinets.

Ballard, Sprague & Company, Inc., New York, N. Y., has issued a twenty-page booklet describing the Ballard-Sprague chimney service and boiler settings.

Benjamin Electric Manufacturing Company, Chicago, Ill., is distributing a pocket catalog No. 23. The book is 5 in. x 6½ in., and contains 250 pages devoted to the illustration and description of the company's electrical products.

The Martindale Electric Company, Cleveland, Ohio, has issued a chart 10 in. x 14 in. showing causes and effects of carbon brush and commutator troubles. This chart is put up in a form which will be of great assistance in locating and correcting troubles on direct-current motors and generators.

Metal & Thermit Corporation, New York, N. Y., has issued the fourth edition of its Thermit Locomotive Pamphlet No. 21, which is of special interest to all railroad superintendents of motive power, general foremen, blacksmith foremen and Thermit welders. The new pamphlet contains many revisions since the last edition was published, chief among which are instructions for applying important improvements in practice in Thermit welding which have been developed by exhaustive research. The drawings and instructions illustrating and describing making Thermit welds in various parts of locomotive frames and other locomotive and railroad equipment have been completely revised since the publication of the last edition to conform to the improved practice.